

1822

Mental Improvement:
OR THE
BEAUTIES AND WONDERS
OF
NATURE AND ART.

THE
OR
BEAUTIES AND WONDERS
NATURE AND ART

1386

Mental Improvement :
OR THE
BEAUTIES AND WONDERS
OF
NATURE AND ART,
CONVEYED
IN A SERIES OF
INSTRUCTIVE CONVERSATIONS.

BY
PRISCILLA WAKEFIELD,
AUTHOR OF LEISURE HOURS. R.

VOL. I.

L O N D O N :
PRINTED AND SOLD BY DARTON AND HARVEY,
NO. 55, GRACECHURCH-STREET.

M.DCC.XCIV.



P R E F A C E.

THE art of exercising the faculty of thinking and reflecting upon every object that is seen, ought to constitute a material branch of a good education; but it requires the skill of a master's hand, to lead the minds of youth to the habit of observation. Dr. Watts says that there are four methods of attaining knowledge. Observation, reading, conversation, and meditation. The first lies within the compass even of children, and from the early dawn of reason, they should be accustomed to observe every thing with attention, that falls under their notice. A judicious instructor will find matter for a lesson among those objects, that are termed common or insignificant. How little this is generally the case, may be collected from the ignorance, not of children only, but sometimes of youth, who, although they have attained a considerable degree

gree of classical learning, are unacquainted either with the materials, of those things they daily use, or the methods of manufacturing them. The form and appearance of substances are so much changed by the effects of art, that it would be impossible for a mind, unprepared by instruction, to conceive the original material of many things, that are in the most common use. Would any child suppose, that the cloth, of which her frock is made, is composed of the fibrous parts of a green plant; or that the paper she draws upon, is the same substance wrought into a different form; that the transparent glass she drinks out of, was once a heap of sand and ashes; or that the ribbon she wears, is the produce of an insect? The design of the following little work, is to excite the curiosity of young persons on these subjects, by furnishing information on a few of the most obvious. The form of dialogue has been adopted as best suited to convey instruction blended with amusement; being desirous that it should be read rather from choice than compulsion, and be sought by my young readers as an entertainment, not shunned as a mere dry preceptive lesson.

CONTENTS

OF THE

FIRST VOLUME.

	PAGE.
<i>A Description of the Whale</i>	11
<i>Of the Whale-Fishery</i>	18
<i>Of the Cod-Fishery</i>	29
<i>Of the Herring-Fishery</i>	36
<i>Of the Salmon</i>	43
<i>Of the Salmon Leap at Ballyshannon</i>	ibid.
<i>The Courage of a Boy in taking a Salmon</i>	48
<i>The Salmon-Fishery</i>	49
<i>The Giant's Causeway</i>	52
<i>Curious properties of the Limpet</i>	54
<i>Keate's Address to the Ocean</i>	36
<i>Reflections</i>	

Reflections on the Order and Wisdom of the

<i>Creation</i>	63
<i>Of the Properties and History of Salt-Mines</i>	64
<i>Of Salt Lands</i>	70
—— <i>Ponds</i>	74
<i>Of the Beaver</i>	81
<i>Of making Hats</i>	94
<i>Of Shells and Fossils</i>	98
<i>Of Shell-Fish</i>	100
<i>Of the Deluge</i>	104
<i>Of the Sacred Writings</i>	105
<i>Shells used as Money</i>	106
<i>Of Polishing Shells</i>	109
<i>Of the Spinning-Fish</i>	112
<i>Of the Cancer Pinnotheris</i>	113
<i>Of the Nautilus</i>	114
<i>Of the Sturgeon</i>	117
<i>Curious Sea Insect</i>	118
<i>Corals and Corallines</i>	121
<i>Of Sponge</i>	128
<i>Of artificial Coral</i>	136
<i>Of early rising</i>	132
<i>Of Pearls</i>	134
<i>Of making Glass</i>	140
<i>Of the Armonica</i>	152
	0

CONTENTS.

iii

	<i>Of Rupert's Drops</i>	153
63	<i>Of the Origin of Glass-windows</i>	154
64	<i>Of Painting on Glass</i>	156
70	<i>Of Sugar</i>	158
74	<i>Description of the Sugar-Cane</i>	160
81	<i>Manner of refining Sugar</i>	171
94	<i>Of the Slave-Trade</i>	161
98	<i>Of Rum and Arrack</i>	174
100	<i>Of the Sugar Maple-tree</i>	177
104	<i>Sheep Shearing described</i>	181
105	<i>Natural History of Sheep</i>	185
106	<i>Manufacture of Wool</i>	191
109		
112		
113		
114		
117		
118		
121		
128		
136		
133		
134		
140		
152		
0		

THE

The Persons,

MR. HARCOURT.

MRS. HARCOURT.

SOPHIA, AGED SIXTEEN.

CECILIA, AGED TWELVE.

**AUGUSTA, AN OCCASIONAL VISITOR,
AGED TWELVE.**

CHARLES, AGED FIFTEEN.

HENRY, AGED NINE.

MENTAL IMPROVEMENT;
IN A SERIES OF
INSTRUCTIVE CONVERSATIONS.

CONVERSATION I.

Sophia and Cecilia.

SOPHIA.

HOW happy are we, my dear sister, to be blessed with such parents, who devote so much time to our instruction and amusement; with what tenderness do they listen to our conversation, and improve every subject that arises to our advantage!

B 2

CECILIA.

Mental Improvement.

CECILIA.

I am never so happy in any other company; they have the art of rendering instruction and study agreeable. Though I tenderly love my governess, I feel such a superior attachment to my mamma, that I am not able to express it; and I am sure Mrs. Selwyn will not blame me for it, for she always advises me to look up to my father and mother as my best and kindest friends:

SOPHIA.

Mrs. Selwyn, our worthy governess is too wise and discreet to be jealous of our preferring our parents to every body, she would sooner direct us to regulate our affections properly, and undoubtedly give them the first place.

CECILIA.

What bitter repentance do I feel, when I have done any thing to offend them, particularly when I am inattentive to their instruction. How comes it, Sophia, that
I am

I am so often idle, and my thoughts wander from what I am about, when I really intend to be good?

SOPHIA.

You are very young, my dear, and mamma says that the habit of attention is difficult to form; but that by steadily endeavouring to fix our thoughts on one object we shall every day find it more easy, and though it may cost us some pains at first, let us remember, what we owe to the affectionate care of such a mother, and give our whole attention, when she condescends to instruct us.

CECILIA.

I often pity poor Augusta; she has no mamma, and her governess seldom teaches her any thing, but her regular lessons.

SOPHIA.

I both love and pity her; she is of a good disposition, but has not received the same advantages that we have; her papa is

B 3

engaged

engaged in business, and leaves her wholly to the care of her governess, who takes but little pains with her.

CECILIA.

Let us desire our parents to give us leave to invite her often to be present at our evening conversations. Papa has promised to give us some account of various manufactures; all will be new to her, she will be delighted, and it will be a means of supplying her with some of the instruction she wants.

SOPHIA.

Mamma will be very willing, I dare say: she takes pleasure in doing good, and is never better pleased than when she has an opportunity of improving young people.

CECILIA.

I long for the evening, when we are all to meet in the study. I wonder what will be the subject he will have prepared for us. My brothers too are to be of the party,

ty, and when we have been separated all day, it is such a pleasure to meet them, that I cannot say how delighted I am with the thoughts of it.

SOPHIA.

It is almost time to attend our writing master, and do not let us forget the terms of admission to these agreeable evening conversations; attention to our lessons in the day, and obedience to the commands of our dear mamma, are the only methods of obtaining a seat in the study at night. Papa will not confine the subject of his lectures wholly to manufactures, but intends to explain the nature of the materials of what we wear and use, which will frequently lead him to describe objects of natural history, a study of which I am particularly fond.

CECILIA.

We are also sometimes to supply a subject, we are to have books given us, that we may be prepared, and are to be questioned

tioned on the given subject. I wish I may be able to answer properly.

SOPHIA.

Hark! the bell rings for writing; we must attend the summons.

CONVERSATION II.

Mr. Harcourt, Mrs. Harcourt, Augusta, Sophia, Cecilia, Charles, and Henry.

MRS. HARCOURT.

MY dear Augusta, I am glad to see you, my girls tell me you desire to be of our party when we meet of an evening. Your company will be always agreeable to me, and I hope our conversations will be instructive to you.

AUGUSTA.

I accept the invitation with pleasure; but I hope to receive entertainment as well as instruction; for I shall never be able to attend to a long dry lecture with-

out some amusement to render it palatable.

MR. HARCOURT.

I have chosen the Whale for our subject to night, and the information it affords I expect will be new and wonderful to you all,

CHARLES.

Is not the Whale found in the seas towards the north pole?

MR. HARCOURT.

Yes, my dear, they chiefly inhabit the seas towards the north pole; though many whales are caught in the South Seas towards that pole, but the chief fishery has been near the coast of Spitzbergen, Nova Zembla, and Greenland; where many ships from this country go every year, for the sole purpose of catching whales.

MRS. HARCOURT.

We may admire the goodness of Providence, who leaves not the most obscure corner of the globe, without its peculiar riches.

riches. These countries, which scarcely supply food for their wretched inhabitants, and are covered with snow, full nine months in the year: are visited by people from distant parts of the world, who brave every danger, for the sake of taking the whales, which are found in their seas.

CECILIA.

I cannot think what use they can be of, to tempt people to go so far for them.

MR. HARCOURT.

You will find that they supply several useful articles for our convenience. Your stays, for example, would not be so well shaped without whalebone.

CECILIA.

Are the bones that stiffen our stays really the bones of whales?

MR. HARCOURT.

The substance called whalebone, adheres to the upper jaw, and is formed of thin parallel laminæ, called whiskers; some

of

of the longest are four yards in length; they are surrounded by long strong hair to guard the tongue from being hurt, and also to prevent the return of their food, when they discharge the water out of their mouth.

HENRY.

Whiskers four yards long! how fierce the whale must look; pray what size is he himself?

MR. HARCOURT.

The common whale is the largest of all animals, of whose history we have any certain account; it is sometimes found ninety feet long, and those which inhabit the torrid zone are said to be much larger. The size of the head is about one third of the whole fish, the under lip is much broader than the upper, which is narrow and oblong, the tongue is a soft, spongy, fat substance, sometimes yielding five or six barrels of oil, the gullet or swallow is very small for so large an animal, not exceeding

ing four inches in width; but that is proportioned to the food it eats, which is a particular kind of small snail; or, as some say, it varies its repast with the Medusa, or sea blubber, an insect which is found in the sea.

SOPHIA.

Is not the whale a fish of prey then? I thought it would devour men, if they unhappily fell in their way.

MR. HARCOURT.

They are quite harmless and inoffensive to every thing but insects. The only danger to be apprehended from them, is the starting of a plank in a ship, or the overturning of a boat, with their huge bulk.

AUGUSTA.

Oh terrible! what can induce men to incur such dangers, when they may stay quietly at home and enjoy themselves?

MRS. HARCOURT.

There are many strong reasons that pre-

val

vail with thousands to undergo a life of hardship, toil, and danger. The necessity of earning a living, to which you, who are brought up in the enjoyment of plenty, are strangers, is one strong inducement.

SOPHIA.

But I would chuse some easier employment; a gardener has an agreeable life.

MR. HARCOURT.

But do you not reflect that all men cannot be gardeners; there is employment for but few in that line. Providence has wisely endued mankind with as great a variety of inclinations and pursuits, as there is diversity in their persons; some shew a very early inclination for a sea-life, that no danger can deter, or persuasions prevail with them to give up; which appears to be implanted for the purpose of providing the means of an intercourse between the inhabitants of distant countries, by which each party may reap advantage by interchanging the superfluous produce of di-

C

stant

stant climes, and exercising the mutual good offices of love and kindness. But to return to the whale; it has two orifices in the middle of the head, through which it spouts water to a great height, and, when it is disturbed or wounded, with a noise like thunder. Its eyes are not larger than those of an ox, and placed at a great distance from each other. There is no fin on the back, but on the sides; under each eye are two large ones, which serve it for rowing. The colour varies, the back of some being red, others black, and another variety is mottled; the belly is generally white. They are extremely beautiful in the water; the skin is very smooth and slippery. Under the skin the whale is covered with fat or blubber, from six to twelve inches thick, which sometimes yields from one to two hundred barrels of oil. All Europe is supplied with oil for lamps, and many other purposes, from this blubber. The flesh is red and coarse, somewhat like beef;

the

the Greenlanders eat it, and the Icelanders soak it in sour whey.

CHARLES.

It must be very disagreeable food. I should think, the oil would make it very greasy and strong.

MR. HARCOURT.

So it does, but the poor people, who live in countries so far north, have but little variety of meat to tempt their appetite. In winter, as your mother has already remarked, the ground is covered with snow, and affords no vegetation but a little moss, which is found on the bodies of trees, consequently the larger animals, such as cattle, &c. cannot subsist there. The reindeer is peculiar to those parts, and supplies his master with a scanty provision during that dreary season; but as they are valuable for many other purposes, they are unwilling to kill them, but from necessity; the flesh of the whale is therefore reckoned a dainty, which may afford us a lesson,

to be contented with beef and mutton, and to discourage that spirit of gluttony and sensual indulgence, that prevails too glaringly at the tables of the rich, who are seldom satisfied with one or two plain dishes, but cover their tables with a profusion, that invites a false appetite, and wastes the good things that are provided for our use .

CHARLES.

Do whales ever stray so far from their usual haunts, as to be found on our coasts? it would give me great pleasure to see one.

MR. HARCOURT.

There have been instances of a few, that have been left at low water on shore, but they occur but seldom; when it happens, they are called royal fish, and become the property of the king and queen. Notwithstanding its vast size, the whale swims swiftly, and generally against the wind. The female brings but one, or at most two young

young ones at a time, which are nine or ten feet long; they suckle their young, and if pursued, shew the same maternal solicitude for the preservation of their offspring, as land animals, by wrapping them up in their fins close to their bodies.

SOPHIA.

Pray, does the whale yield any other produce that is useful to man, except oil and whalebone?

MR. HARCOURT.

Yes. Spermaceti is prepared from the oil that is found in the head of a whale. It is melted over a gentle fire, and put into moulds, like those wherein sugar loaves are formed; when cold and drained, it is taken out, and melted over again, till it be well purified and whitened; it is then cut with a knife into flakes, and is used as a medicine for various complaints of the lungs; it is also used for making candles, which are but little inferior to those made of wax.

C 3

CHARLES.

CHARLES.

I cannot imagine what means can be devised to catch and manage an animal of such prodigious size,

MR. HARCOURT.

No animal is so large or powerful, but must yield to the superior sagacity of man. The method of taking whales is truly curious, and I shall have pleasure in entertaining her with a recital of it.

ALL.

Pray begin, we are all attention.

MR. HARCOURT.

The fleet usually sets sail about the beginning of April, and steers northward, till they reach about the 75th degree of north latitude, where they usually begin to meet with the ice. It is among these huge heaps of ice, that float about in these seas, that they find the whales, and there most of the vessels fix their abode for the fishing. In the English whale fishery, every ship has six or seven boats belonging to it, each of which
has

has one harpooner, one man to steer, one to manage the line, and four seamen to row it; each boat is provided with two or three harpoons, several lances, and six lines fastened together, each one hundred and twenty fathoms long. To each harping iron is fastened a strong stick, about six feet long, and a soft pliable line of as many fathom, called the fore gauger, which is fastened to the lines in the boat. The instrument with which the whale is struck, is a harping iron, or javelin, pointed with steel, in a triangular shape, like the barb of an arrow. The harpooner, upon sight of the fish, flings the harping iron with all his might against his back; and if he be so fortunate as to penetrate the skin and fat, into the flesh, he lets go a line fastened to the harping iron, at the end of which is a gourd, which swimming on the water, discovers where the whale is: for, the minute he is wounded, he plunges to the bottom, commonly swim-

swimming against the wind; and this is the moment of danger, lest he should outrun the length of the line, and pull the boat after him into the deep; to guard against this inconvenience, a man is fixed by the line with a sharp knife, ready to cut it in a moment, in case of necessity. If the whale return for air to breathe, the harpooner takes the opportunity to give him a fresh wound, till fainting by loss of blood, from repeated wounds, the men seize that moment for approaching him, and thrusting a long fleeced lance under his gills, into his breast, and through the intestines, soon dispatch him. When the carcase begins to float, they cut holes in the fins and tail, and tying a rope in them, tow him to the vessel, where he is fastened to the larboard side of the ship, floating upon his back, almost level with the sea.

CHARLES.

What wonderful skill and dexterity
are

are requisite in a Greenland sailor! I should like to make one voyage with them.

MRS. HARCOURT.

Your curiosity and ardour are excited by the account your father has given us of their expeditions, but you are not aware of the hardships they undergo from the severity of these northern climates.

AUGUSTA.

I have been accustomed to look with contempt on such people, as greatly my inferiors; but for the future, I will try to respect every body whose employments are useful.

MR. HARCOURT.

You will do right; for a Greenland whale catcher is a much more valuable member of society, than an idle man of fortune, who lives on the labours of others. In order to take the blubber or fat, from which they procure the oil, and the fins, as they are called, or whalebone, several men
get

get upon the fish, equipped with a kind of iron calkers or spurs, to prevent their slipping, and cut off the tail, which is hoisted on deck, and then cut square pieces of blubber, weighing two or three thousand pounds, which are hoisted on board with the capstan, where each piece is again divided into smaller pieces, of two or three hundred pounds weight, then these are thrown into the hold, and left for a few days to drain. When all the blubber is cut from off the belly of the fish, it is turned on one side, by means of a piece of blubber, left in the middle, called the cant or turning piece; thus they cut out the sides in large pieces, which they call hockies. The next operation is to cut out the two large jaw bones, situated in the under lip, which, when hoisted on deck, are cleansed, and fastened to the shrouds, with tubs placed under them to catch the oil which they discharge. The carcase is left to float, and supplies food for Greenland

land birds, called malle-mucks, &c. After the pieces of blubber have lain a few days in the hold, they hoist them on deck, cut them into small pieces, and put them through the bung holes into their casks; one of the largest fish will fill more than seventy butts. The produce of a good large whale is valued at about one thousand pounds. When thus richly laden, they begin to sail homewards with their spoil: when they return, the fat is to be boiled, and melted down into train-oil. The whale fishery begins in May, and continues through the months of June and July. Whether the ships are successful or not, they must come away, and get clear of the ice before the end of August.

SOPHIA.

I thank you, my dear papa, for this very entertaining account. I shall never see a piece of whalebone, but I shall think of
the

the labours and difficulties of the poor Greenland sailors.

CHARLES.

I admire the courage and ingenuity of those who first attempted to catch whales.

MR. HARCOURT.

Probably accident discovered the use that might be made of them, and induced some needy bold adventurer to make the attempt; but many must have been the hazards and disappointments before the art was reduced to a system as it is now. Rude and imperfect is the beginning of all knowledge. Perseverance and experience have contributed more than genius, to the discovery of things useful, to accommodate the life of man.

MRS. HARCOURT.

Much is due to the man who first ventured his life to procure so useful a commodity as train oil, without which, many must pass a long dreary winter's night, without even the cheering rays of a lamp.

HENRY.

HENRY.

But, mamma, they can buy candles.

MRS. HARCOURT.

Candles, indeed, are very useful; but oil is cheaper, and there would not be a sufficient quantity of tallow to light our streets of a night. All the cities in Europe are lighted with oil, which is a great accommodation to their respective inhabitants.

CECILIA.

Are there no other fisheries you can give us an account of, papa?

MR. HARCOURT.

Yes, my dear, the cod, herring, and salmon fisheries are very useful and extensive, and employ a great number of hands; but our conversation has held long enough for one time, we will reserve them for the subject of another evening.

MRS. HARCOURT.

It is almost supper time, and little Henry seems ready for bed.

D

HENRY.

HENRY.

Indeed, mamma, I am not very sleepy, and could sit a great while longer to hear papa tell us more about these huge whales, and mountains of ice.

MR. HARCOURT.

I will oblige you another time. It is too late now. Adieu, my dear children.

CONVERSATION III.

Mr. and Mrs. Harcourt, Augusta, Sophia, Cecilia, Charles, and Henry.

CECILIA.

We have all waited with the greatest impatience for the hour of meeting. If the cod and herring fisheries afford us as much entertainment, as the catching of whales, we shall not soon be tired.

MRS. HARCOURT.

I am glad to hear you were pleased with
last

last night's conversation; it is a proof that your minds are capable of relishing rational amusement. An early habit of trifling is difficult to be subdued, and should be carefully avoided; thousands are rendered unhappy by it; for having never been accustomed to exercise their faculties, as they grow up, they find every thing fatiguing that requires reflection, and as the mind cannot rest wholly inactive, they fly from one trifling, useless pursuit to another; always tired of themselves, and rendering no benefit to others; but a well regulated mind is marked by the judicious disposal of time, converting even amusement into instruction. Nature and art present so many objects, calculated to amuse and interest, that none but the idle need want a succession of employment.

AUGUSTA.

Pray, have the kindness to instruct me how to fill up my time. I am often so much at a loss what to do with myself,

D 2

that

that I wish for night, to put an end to the long day. As soon as my lessons are over, and nothing can be more tiresome than they are, I am without employment, and wander about without knowing what to do with myself. My governess says, that I must not be troublesome to her, after I have finished my tasks; so I have no body to converse with, nor any thing to amuse me, but playing about, till I am tired.

MRS. HARCOURT.

Come to us every evening; I hope our conversations will furnish you with many sources of entertainment for your leisure hours. I am willing to point out whatever may occur worthy your further attention, and by strictly adhering to a few simple rules, you will find the day become as short as you wish it.

AUGUSTA.

Pray give me these rules. I shall willingly adopt them.

MRS.

MRS. HARCOURT.

Perhaps it will not be so easy at first, as you imagine; ill habits are difficult to surmount; but by degrees it will become familiar, and in time agreeable. In the first place, never be unemployed; read, draw, work, walk, and accustom yourself to observe every thing you see with attention; consider how they are made, what the materials are, and where they come from. If you are unable to discover the answers, keep a little book, and make a memorandum of what you want to know, and we will endeavour to give you information. This alone will fill many an hour, that now passes tediously away.

AUGUSTA.

I thank you for these directions, and will begin to-morrow; but I have hindered Mr. Harcourt from beginning his account of the cod.

MR. HARCOURT.

The cod is a fish of passage, and is found

D 3

from

MRS.

from eighteen inches to three or four feet long, with a great head, and teeth in the bottom of the throat, its flesh white, its skin brownish on the back, and covered with a few transparent scales. It eats excellent, when fresh; and if well prepared and salted, will keep a long time. Salt-fish or stock fish, commonly eaten in Lent, is cod thus prepared. There are two kinds of salt cod, the one called green or white, the other dried or cured. The most essential thing in the green cod-fishery, is the skill of the persons employed to open the fish, to cut off the heads, and to salt them, upon which last, the success of the voyage chiefly depends. The principal fishery for cod is on the banks of Newfoundland, in North America; and the best season, from the beginning of February to the end of April, when the cod, which during the winter, had retired to the deepest part of the sea, return to the bank, and grow very fat. Each fisher takes but one cod at a time, yet the

more

more experienced will catch from three hundred and fifty, to four hundred every day. This is a very fatiguing employment, both on account of the weight of the fish, and the extreme cold which reigns on the bank. They salt the cod on board. The head being cut off, the belly opened, and the guts taken out, the salter ranges them in the bottom of the vessel, head to tail, and having thus made a layer of them, a fathom or two square, he covers them with salt, over this he places another layer of fish, which he covers as before, and thus he disposes all the fish of that day, taking care never to mix the fish of different days together. By the time they have lain three or four days thus to drain, they are removed into another part of the vessel, and salted again; then they are left untouched till the ship has got its load, unless they put them in barrels for the convenience of room.

SOPHIA

SOPHIA.

The curing and taking of cod must be less disagreeable and dangerous than whale-catching. I had no idea that the catching of fish alone employed so many men.

MRS. HARCOURT.

We are apt to use and consume the necessities and conveniences of life, without reflecting on the pains and labour necessary to obtain them. The smallest domestic accommodation is frequently not to be had, without the assistance of several hands; a pin or needle, for instance, employs a great number of workmen, before they are brought to the degree of perfection, in which we receive them. And the supply of a common table, if we consider the resources from which it is drawn, most probably employs the time and labour of thousands; but we interrupt your father from proceeding, this subject may be resumed another time.

MRS.

MR. HARCOURT.

In the fishing for dry cod, vessels of various sizes are used, though such are generally chosen as have large holds, because this kind of fish incumbers more than it burthens. As cod can only be dried by the sun, the European vessels are obliged to put out in March or April, in order to have the benefit of the summer for drying. Indeed the English send vessels for cod later, but they only purchase of the inhabitants what had been caught and prepared before hand. In exchange for which, we carry them meal, brandies, biscuits, pulse, molasses, linen, &c. The fish chosen for this purpose, though the same species as the green cod, is yet much smaller. As soon as the captains arrive, they unrig all the vessels, leaving nothing but the shrouds to sustain the masts; and, in the mean while, the mates provide a tent on shore, covered with branches of fir, and sails over them, with a scaffold, fifty or sixty feet long, and about

about one third as broad. While the scaffold is making ready, the crew are fishing, and as fast as they catch, they bring their fish, open them, and salt them on moveable benches; but the main salting is performed on the scaffold, called flake. When the fish have taken salt, they wash them, and lay them on piles, on the galleries of the scaffold, to drain again, when sufficiently drained, they are ranged on hurdles, a fish thick, head against tail, with the back uppermost; observing, while they lie thus, to turn and shift them four times every twenty-four hours. When they begin to dry, they lay them in heaps of ten or twelve a piece, to retain their warmth, and continue to enlarge the heap every day, till it becomes double its first bulk. At length they join two of these heaps into one, which they turn every day as before; lastly salt them over again, beginning with those that had been salted first, and in this state lay them in huge piles, as big as hayricks;

ricks; and thus they remain, till they are carried on ship-board, where they are laid on branches of trees, disposed for that purpose, in the bottom of the vessel, with mats around them, to prevent their contracting any moisture. There are four kinds of commodities drawn from cod; the zounds, which is a jelly like substance, that covers the inside of the main bone, and the tongues are salted at the same time with the fish, and barrelled up for eating. The roes or eggs being salted and barrelled, are useful to cast into the sea, to draw fish together, particularly pilchards; and lastly the oil, which is used in dressing of leather; and thus, by the art and ingenuity of man, every part of this fish, that can be serviceable is put to use; and by his skill in curing and drying it, a large supply of wholesome provision is preserved, which must otherwise be lost. Nor is this care bestowed on the cod alone; the herring supplies food to vast numbers of families, especially

pecially the poorer sort, to whom they are a great relief, when other provisions are dear; but perhaps you are all tired of this subject, and wish to hear no more concerning the catching of fish; if that be not the case, the herring, though a small fish, will furnish us with wonders almost as extraordinary as the whale.

HENRY.

I am the youngest of the company, and I am not at all tired.

CHARLES.

You surprise me by talking of wonders concerning the herring; I have seen many of them, but never observed any thing in them to excite my attention, beyond fish in common.

MR. HARCOURT.

It is not any thing remarkable in the construction of the individual fish, to which I allude, but to the prodigious numbers in which they assemble, at certain seasons of the year. About the beginning of June,
a shoal

a shoal of herrings, in bulk not less than the whole extent of Great Britain and Ireland comes from the north, on the surface of the sea; their approach is known to the inhabitants of Shetland (an island to the north of Scotland) by several tokens in the air and water, as by the birds, such as gannets, &c. which follow, in order to prey upon them; and by the smoothness of the water. It is not certainly known whence they come, though it is probable, that their winter rendezvous is within the arctic circle, where the seas swarm with insect food in greater abundance than in our warmer latitudes. They cast their spawn when they arrive in these seas, for they come to us full, and are shotten long before they leave us. The great shoal divides into columns of five or six miles in length, and three or four in breadth, reflecting, in bright weather, as they pass, many splendid colours.

E

SOPHIA,

SOPHIA.

Well might you say, you had wonderful things to relate; I had formed no idea of shoals of fish, of such prodigious extent. The astonishing particulars we have already heard, make me suppose that the sea, and its produce, would furnish us with an inexhaustible fund of entertainment.

MR. HARCOURT.

The subject is too extensive for our limits; the wonders of the deep have not yet been fully explored; but the most obvious particulars, that are ascertained, I shall with pleasure relate, as they illustrate and confirm our notions of the wisdom and goodness of that divine Being, who careth for all the works of his creation, and has provided for the respective wants of each.

CECILIA.

Pray papa, what kind of fish is the her-
ring? I am not at all acquainted with it.

MR.

MR. HARCOURT.

The herring is a small salt-water fish, with a bluish back, and a white silvered belly. It is commonly said that nobody ever saw a herring alive, they die so immediately on being taken out of the water; but there have been instances to the contrary. By what I have already told you, you will perceive that the herring is a fish of passage; they go chiefly in shoals, and are fond of following any fire or light; indeed, as they pass, they resemble a kind of lightning themselves, their colours glancing against the sun. The method of pickling and curing herrings is simple; there are two ways of doing it, the one makes white or pickled herring, the other what is called red herring. The white or pickled herring is prepared by cutting open and gutting the fish, as soon as it is taken out of the water, but the melts and roes are always left in; they are then washed in fresh water, and left for twelve or fifteen

hours in a tub full of strong brine, made of fresh water and sea salt. They are then taken out and drained, and when well drained, put up in barrels, disposed evenly in rows or layers, pressed well down, and a layer of salt strewed over them at top and bottom. After washing, gutting, and salting the fish, as above, when they intend to make them red herrings, they string them by the head, on little wooden spits, and hang them in a kind of chimney, made for the purpose, and when the chimney is filled, which generally requires ten or twelve thousand fish, they make a fire underneath of brush-wood, which yields much smoke, but no flame, which mostly dries them sufficiently in twenty-four hours; they are then barrelled for keeping. These are the most important fisheries, and employ by far the greatest number of people, though there are many poor men who live on the sea coasts, whose scanty subsistence depends on the dangerous and precarious employ.

employment of fishing; a little boat is their chief treasure, in which they venture out in rough and boisterous weather, when the pressing wants of their family urge them to the undertaking.

MRS. HARCOURT.

Their danger and hardships are increased, by being obliged to struggle with rough weather, and the storms of winter, that being the principal season for fishing.

CECILIA.

The sufferings of the poor are very great on shore, in cold weather; their miserable huts and tattered cloaths, scarcely defending them from the sharpness of the air, not to mention their scarcity of fuel. I wonder how they support such hardships.

MRS. HARCOURT.

Aged persons and infants sometimes sink under these difficulties, but those in middle life, who are able to use exercise, support them with less injury. Let these re-

reflections instruct us to feel for the wants of others, and endeavour to relieve them, by retrenching our superfluous indulgencies; they should inspire us at the same time with gratitude to the Giver of all good, for the numerous blessings he has allotted us, above many other of our fellow creatures, with thankful acknowledgment. Let us close the day, and each one retire to repose.

CONVERSATION IV.

CHARLES.

I HAVE found the subject of the fisheries so new and entertaining, that far from being tired of them, my curiosity is raised to hear more of them. When you returned from Ireland, I think you mentioned having visited the salmon fisheries; be
so

So kind as to give us the particulars you remember of them?

MR. HARCOURT.

The salmon is a very curious fish, its instincts and habits are well worth our attention. The principal salmon leaps (as they are called) in Ireland, are at Coleraine, and at Ballyshannon, which is a small town situated near the sea, with a bridge of fourteen arches over a river which, at a small distance, falls down a ridge of rocks about twelve feet, and at low water forms a very picturesque cascade.

HENRY.

Do the salmon abound in that river? it must be very pretty to see them tumble down the waterfall.

MR. HARCOURT.

Almost all the rivers, lakes, and brooks in this island afford great plenty of these fish; some during the whole year, and some only during certain seasons; they generally go down to the sea about August and Sep-

September, and come up again in the spring months; and, what is very remarkable, the same fish always come back to the same river, so that the owners of the fishery are not afraid of losing their fish.

SOPHIA.

Fish appear so stupid, and void of intelligence, that extraordinary instincts in them strike one with more wonder than in other animals.

MR. HARCOURT.

The great Creator has impressed certain propensities so strongly on different animals, that they are irresistible; and this powerful inclination stands them in stead of reason, which is given to man, as a being of a superior order, to guide his judgement and direct his conduct through the various scenes of life.

CHARLES.

What inducement can these fish have for thus changing the place of their habitation,

MR.

MR. HARCOURT.

Fresh water seems to be more suitable, than the sea, for depositing their eggs and rearing their young. It is said that the females work beds in the sandy shallows of rivers, and there lay their eggs, which the male impregnates; afterwards they both are employed in covering the eggs with sand, each partaking in the labour necessary for bringing the eggs to perfection; these in time become vivified, and take their course to the sea, being then about four inches long. After a stay of six weeks, or two months, they return up the same rivers; the salt water having caused them to attain nearly to half their full growth, in that short space of time.

MRS. HARCOURT.

Salmon, and perhaps many other kinds of fish, seem absolved, by the laws of nature, from the sedulous attention in rearing their young, that is requisite in birds, and terrestrial animals; their chief care is

to

MR.

to provide for the preservation of the eggs, by depositing them in a suitable place, and after they have performed that office, they appear to have no farther thought about them. Strangers to the pleasing solicitude of parental fondness, they may with propriety be ranked in an inferior scale of existence to the beautiful feathered race, whose tenderness and patient care may serve as models to careless mothers, who neglect their offspring, from indolence, or a love of other pursuits.

MR. HARCOURT.

When I was at Ballyshannon, I passed several hours in watching the fish leap up the cascade, and it is hardly credible, but to those who have been eye-witnesses, that they should be able to dart themselves near fourteen feet perpendicularly out of the water; and, allowing for the curvature, they leap at least twenty. They do not always succeed at the first leap; sometimes they bound almost to the summit, but the
falling

falling water dashes them down again; at other times they dart 'head-foremost, or side-long upon a rock, remain stunned for a few moments, and then struggle into the water again; when they are so successful as to reach the top, they swim out of sight in a moment. They do not bound from the surface of the water, and it cannot be known from what depth they take their leap; it is probably performed by a forcible spring with their tails bent; for the chief strength of most fish lies in the tail. They have often been shot, or caught with strong barbed hooks fixed to a pole, during their flight, as it may be termed; and instances have been known of women catching them in their aprons. At high water, the fall is hardly three feet, and then the fish swim up that easy acclivity without leaping. Sometimes I have seen at low water fifty or sixty of these leaps in an hour, and at other times only two or three. I placed myself on a rock on the brink of the

the cascade, so that I had the pleasure of seeing the surprising efforts of these beautiful fish close to me; and at the bottom of the fall, porpoises and seals tumbling and playing among the waves; and sometimes a seal carries off a salmon under his fins.

AUGUSTA.

I knew a boy of nine years old, who lived in Scotland, where the rivers are remarkably clear; he saw a salmon sporting in the water at the bottom of his father's garden, and jumped in. The fish was large and strong, and struggled to escape from his hold; but after a pretty smart contest, the boy came off victorious, and brought his antagonist safe to land.

HENRY.

That must have been fine sport; I should like to have been of the party.

CHARLES.

This account is very entertaining; but I want to know their method of taking these fish.

MR.

MR. HARCOURT.

They are caught in weirs, which are formed by damming up the river, except a space of three or four feet in the middle, which the salmon having passed, are caught in a small enclosure, formed by stakes of wood; the entrance is wide, and gradually lessens, so as barely to admit a single salmon at a time. Every morning, during the fishery, they are taken out, by means of a staff, with a strong barbed iron hook, which is struck into them. But at Ballyshannon, by far the greater number is caught in nets below the fall; they sometimes catch near one hundred at a throw. The time of the fishery is limited; and after it is elapsed, the enclosure is removed, the nets are laid aside, and the fish are at liberty to flock the rivers with spawn. The chief salmon fisheries, besides those in Ireland, are at Berwick on the Tweed, and along the coasts of Scotland. Vast quantities are salted or pickled, and put up in

F

cags,

cags, and sent to different parts of the kingdom.

MRS. HARCOURT.

There are also great quantities of salmon brought fresh to the London markets, by being packed in ice; which, by excluding the air, is found a preservative to many other things. The inhabitants of the northern parts of Europe, the Russians especially, preserve their fowls and other provisions, during their hard winters, when meat is difficult to be procured, in snow and ice.

MR. HARCOURT.

It would be tedious and unnecessary to particularise the various kinds of fisheries that are in different parts of the world. Oysters, lobsters, pilchards, anchovies, and sturgeon, are all caught in great quantities; the three latter pickled or salted down for use. Cavear or kavia, a sauce much prized by the Italians, is made of the roe or eggs of the sturgeon. All these form extensive branches of commerce, and
supply

supply vast numbers of people with food, who reside at a great distance from the places at which they are caught; at the same time, that they are a means of maintaining thousands of families, by furnishing useful and profitable occupation to them; nor must we omit to mention the great variety and vast numbers of fresh fish, that are eaten without being salted, which daily supply our markets, and provide us with an agreeable change of diet. The produce of the ocean is inexhaustible; nor is it confined to fish alone; the bottom is covered with vegetation in many parts.

AUGUSTA.

How is it possible to know that?

MR. HARCOURT.

The sea throws up a great variety of sea weeds. Divers also relate that this is the case.

CHARLES.

Can men dive to the bottom of the sea?

MR. HARCOURT.

There are people who are very expert in diving; but a full account of this curious art is better deferred to another evening, as we have not time to enter into a complete description of the methods of performing it.

SOPHIA.

I have heard that the Giant's Causeway in Ireland is a great natural curiosity; had you an opportunity of seeing it, when you were in that country?

MR. HARCOURT.

It was an object that I paid particular attention to. It is situated at the northern extremity of the island. It consists of about thirty thousand natural pillars, mostly in a perpendicular situation. At low water the causeway is about six hundred feet long, and probably runs far into the sea, as something similar is observed on the opposite coast of Scotland. It is not known whether the pillars are continued under ground,

ground, like a quarry. They are of different dimensions, being from fifteen to twenty-six inches in diameter, and from fifteen to thirty-six feet in height: their figure is generally pentagonal or hexagonal. Several have been found with seven, and a few with three, four, and eight sides, of irregular sizes; every pillar consists as it were of joints or pieces, which are not united by flat surfaces; for on being forced off, one of them is concave in the middle, and the other convex, many of these joints lie loose upon the strand. The stone is a kind of basalt, of a close grit, and of a dusky hue; it is very heavy, each joint generally weighing two hundred and a half. It clinks like iron, melts in a forge, breaks sharp, and, by reason of its extreme hardness, blunts the edges of tools, and by that means is rendered incapable of being used in building. The pillars stand very close to each other, and though the number of their sides differ, yet their contextures are

so nicely adapted, as to leave no vacuity between them, and every pillar retains its own thickness, angles, and sides, from top to bottom. These kinds of columns are continued, with interruptions, for near two miles along the shore. By its magnitude and unusual appearance, it forms altogether an object of great rarity, and is mostly visited by all strangers, who have any curiosity.

MRS. HARCOURT.

This is a wonderful account. It seems to be one of those productions of nature that may be termed an unique. I know of nothing similar to it. I met with a passage, last night, in Collinson's History of Somerset, though not immediately referring to the subject before us, that I cannot resist the pleasure of repeating. It is concerning a peculiar property of the limpet (a species of shell-fish), that is found at Minehead in that country; that contains a liquor curious for marking linen. When
the

the shell is picked off, there will appear a white vein lying transversely in a little furrow next the head of the fish, which may be taken out by a bodkin, or any other pointed instrument. The letters or figures made with this liquor will presently appear of a light green colour, and if placed in the sun, will change into the following colours; if in winter, about noon, if in summer, an hour or two after sun-rising, and so much before setting; for in the heat of the day in summer, it will come on so fast, that the succession of each colour will scarcely be distinguished. Next to the first light green, it will appear of a deep green, and in a few minutes change to a full sea green; after which, in a few minutes more, it will alter to a blue, then to a purplish red: after which, lying an hour to two, (if the sun shines) it will be of a deep purple red, beyond which the sun does no more. But this last beautiful colour, after washing in scalding water and soap,

soap, will, on being laid out to dry, be a fair bright crimson, which will abide all future washing. This species of limpets are, some red, others white, black, yellow, brown, and sand colour, and some are striped with white and brown parallel lines.

SOPHIA.

I should like to have a specimen of this marking liquor. It must be the most elegant of all methods of imprinting letters, &c. on linen.

MRS. HARCOURT.

I believe I have trespassed upon your father's time by this account, but I was much pleased with it. Cecilia, close this conversation, by reciting Mr. Keate's Address to the Ocean.

ADDRESS TO THE OCEAN.

CECILIA.

Hail! thou inexhaustible source of wonder and contemplation! Hail! thou multitudinous

titudinous ocean! whose waves chase one another down like the generations of men, and after a momentary space, are immersed for ever in oblivion! Thy fluctuating waters wash the varied shores of the world, and while they disjoin nations, whom a nearer connection would involve in eternal war, they circulate their arts, and their labours, and give health and plenty to mankind. How glorious! how awful are the scenes thou displayest! whether we view thee when every wind is hushed; when the morning sun silvers the level line of the horizon; or when the evening track is marked with flaming gold, and thy unrippled bosom reflects the radiance of the over-arching heavens! Or whether we behold thee in thy terrors! when the black tempest sweeps thy swelling billows, and the boiling surge mixes with the clouds! when death rides the storm, and humanity drops a fruitless tear for the toiling mariner, whose heart is sinking with dismay!

And

And yet, mighty Deep! 'tis thy *surface* alone we view. Who can penetrate the secrets of thy wide domain! What eye can visit thy immense rocks and caverns, that teem with life and vegetation? or search out the myriads of objects, whose beauties lie scattered over thy dread abyss? The mind staggers with the immensity of her own conceptions; and when she contemplates the flux and reflux of thy tides, which, from the beginning of the world, were never known to err, how does she shrink at the idea of that Divine Power, which originally laid thy foundations so sure, and whose omnipotent voice hath fixed the limits, where thy proud waves shall be stayed!

CON-

CONVERSATION V.

HENRY.

I HAVE been thinking, dear papa, that if there were as many whales as herrings, the sea would be hardly large enough to hold them.

MR. HARCOURT.

Providence has wisely limited the fruitfulness of the larger animals, both on land and in the sea, to a small number: whales, lions, and eagles seldom bring forth more than two at a time. We may also observe with thankfulness, that the increase of noxious animals are generally restricted by the same wise law of nature; whilst those creatures, which are useful to man, multiply very fast. Did the birds and beasts of prey, and huge serpents, increase as fast as domestic animals, this globe would be no longer habitable; we should be forced

ed to resign our places to them, and they would become lords of the creation.

MRS. HARCOURT.

Your observation ought to excite in us a lively gratitude for the wise arrangement and proportion of creatures in the universe; a striking proof of the wisdom and goodness that governs all things. I have been frequently astonished at the accounts I have read of the increase of fish. There have been found in one cod-fish, 3,686,760 eggs; now, supposing only half, or even a quarter of these eggs to come to perfection, the increase is prodigious. Other kinds of fish multiply also in a surprising degree; yet there is no reason to think, that any one kind increases beyond its due proportion with the rest. According to what we remark among the animals, that we have an opportunity of observing, each has its enemy; and it is reasonable to suppose that the same law prevails in the sea; and that each kind has
a power-

a powerful adversary, that diminishes its numbers, and keeps them within due limits.

SOPHIA.

Who could have the patience and perseverance to count such a vast number of small eggs?

MRS. HARCOURT.

Many naturalists have taken great pains to investigate this curious subject; but Mr. Harmer has pursued it with more success than any of them, by an ingenious method of first weighing the whole spawn very exactly, he then separated a certain number of grains, and carefully counted the number of eggs they contained, by which number he multiplied the remaining grains; thus, by the advantage of method and regularity, he obtained the knowledge of a curious fact in nature easily, in comparison of the trouble he must have taken, to have ascertained it by the tedious method of counting the whole.

G

CECILIA.

CECILIA.

Now I am convinced of what you have often told me, that nothing can be well done without order and method. I will endeavour to be more attentive to this point, and do every thing with greater regularity for the future.

MRS. HARCOURT.

Order is, indeed, the best guide in every kind of business, and distinguishes a well taught mind, from one that is uninstructed. It should extend to all our concerns; the disposal of our time and money, the proportion of amusement and business should be regulated by some rule, and not left to the direction of mere chance, as is too often the case with many thoughtless people.

CHARLES.

What a prodigious quantity of salt must be consumed in the curing of such multitudes of fish! I am ashamed to confess that

I am

I am
an artI w
manne
ly hav
for ou
salt, u
fish, &
saries
fossil
spring
in larg
of the
more
yellowCol
that kiAll
are mi
world
Germ

I am ignorant whether salt be a natural or an artificial substance.

MR. HARCOURT.

I will give you some account of the manner of its production: you could hardly have chosen a more entertaining subject for our evening's conversation. Common salt, used for seasoning and preserving meat, fish, &c. is one of the most useful necessities of life; and is of three kinds, viz. fossile or rock salt; sea or marine salt; and spring salt. Fossile or rock salt is found in large beds, or strata, within the bowels of the earth, sometimes crysallized, but more frequently in irregular masses of red, yellow, or blue colour.

HENRY.

Coloured salt! I never have seen any of that kind, why do we not use it?

MR. HARCOURT.

All salt becomes white by grinding. There are mines of rock-salt in various parts of the world; they are found in Poland, Hungary, Germany, Italy, Spain, and England; as well

as in some other countries in Europe. I shall confine myself to describe the manner of procuring this kind of salt, before I say any thing of the other sorts. The account of the Polish mines, in the village of Wilizka, five leagues from Cracow, the capital of Poland, which were discovered in the year 1251, will furnish us with an idea of them, that will serve for a description of salt mines in general. Their depth and capacity are surprising. Within them exists a kind of subterraneous republic, or commonwealth, which has its policy, laws, families, &c. nay, even public roads, for horses and carriages are kept here, for the purpose of drawing the salt to the mouth of the quarry, where it is taken up by engines. These horses, when they are once down, never see the light again; but the men take frequent occasions of breathing the fresh air. What astonishment must a traveller feel, on arriving at the bottom of this wonderful abyfs, where so many peo-

ple

ple are interred alive, and numbers of them even born there, that have never seen day-light. The first thing that strikes him with surprize, is a long series of vaults, sustained by huge pilasters cut with the chissel out of the rock salt, resembling so many crystals, or precious stones of various colours, reflecting a lustre from the light of the flambeaux, which are continually burning, that dazzles the eye with its splendour; nor can he be less surprised at observing a clear rivulet of fresh water running through the midst of these mountains of salt, and supplying the inhabitants with a source of comfort and accommodation, little to be expected in such a dreary region. The workmen he will find employed in hewing the rocks of salt, in form of huge cylinders, using hammers, pick-axes, and chissels, much as in our stone quarries, in order to separate the several banks. As soon as the massive pieces are got out of the quarry, they

break them into fragments proper to be thrown into the mill, where they are ground, and reduced into a coarse farina, or flour, which serves all the purposes of sea salt.

CHARLES.

I remember going once with you into a stone quarry, and can therefore easily form an idea of it; but I am surprised to hear that salt is so hard as to require hammers and pick-axes to separate it.

MR. HARCOURT.

In its natural state, the masses of rock salt are very hard; there are two kinds of sal gemma found in the salt mines of Wilizka; the one harder, and more transparent, and the crystallization of which appears more perfect than that of the other; this is the sal gemma of the druggists and dyers. It cuts like crystal, and is frequently used for toys, chaplets, little vases, &c. I think I must procure you some specimens of them, Sophia; they will
deserve

deserve a place in your cabinet of natural rarities.

SOPHIA.

I shall value them very highly, both as your gift, and as a great curiosity.

MR. HARCOURT.

The other kind is less compact, and suitable only for kitchen uses. The colour of the salt, while in the mass, is a little brownish; and yet, when ground, it becomes as white as if it had been refined. Some of these masses are found as hard and transparent as crystal; some white, yellow, blue, and fit for various works of taste, in which they engrave as on precious stones. The mine is cold and moist, which causes some difficulty in reducing the salt into powder. They make a blackish salt of the water drawn out of it, which serves to fatten cattle. The salt mines of Catalonia are found in the mountains of the Duchy of Cordona; they form a solid mountain of rock salt, between four and five

five hundred feet in height, and a league in circumference, and descending to an unknown depth below the surface. This prodigious mountain of salt, which has no mixture of other matter with it, is esteemed a great natural curiosity, and has raised a doubt among naturalists, whether salt does not vegetate or grow. To give you an imperfect idea of the quantities of salt produced annually, it is said, that one of the Northwich pits, which is in Cheshire, has yielded, at a medium, four thousand tons of salt in a year. This salt is esteemed unfit for domestic uses, in its natural state; and therefore they use the method practised in Poland, Hungary, and many other places, on the coarser rock salt; they refine it, by dissolving it in weak brine, and then boiling it into salt again. The works, where the rock salt is refined, are called Refineries. The rock salt is broken small, and put into leaded cisterns, where it is dissolved in cold sea-water, when the
solution

solution has stood a day and night to settle, it is drawn off from the sediment into the salt-pan, and refined into salt in the same manner that common salt is boiled up. The scratch, or calcarious matter falling from it, forms a crust on the sides of the cistern. They are careful not to waste the brine left in the pans after the salt is taken out, but add it to the next quantity put into the pan, and so on to the end of the works. I cannot dismiss the subject of rock salt, without mentioning the island of Toong-ming, in the East Indies, which affords the most remarkable kind of fossile, or native dry salt, in the world. The country is, in general, very fruitful, but in certain parts of the island there are spots of ground, of several acres, which appear wholly barren, yielding not the least appearance of any thing vegetable on them. These spots of ground taste very salt, and abound with salt in such a manner, as not only to supply the whole

whole island, but a great part of the neighbouring continent.

AUGUSTA.

Have the people in this country no other mark to find out the places that produce the salt, than the barrenness of the spot?

MR. HARCOURT.

When the inhabitants perceive the ground become dry, and covered with white spangles, which are pieces of salt, they are sufficiently assured that this is a proper place to dig for that commodity. It is very remarkable that the same pieces of land, which produce vegetables one year, will produce this salt another; and on the contrary, the salt parts will, some seasons, be covered with vegetation. The salt work in this island is of great advantage to the inhabitants, and supplies all the poor, during the season, with employment. The men are occupied in collecting the salt, and wetting the earth, and the women in boiling

ing up the water, which they attend as carefully as the men. The second kind of salt is marine or sea salt, which is made from sea water, thickened by repeated evaporation, and at length crystallized.

HENRY.

I do not understand what evaporation means.

MR. HARCOURT.

Heat, caused either by the action of the sun or fire, makes the watery particles of sea-water fly off, or disperse into the air, and leave the saline parts at the bottom of the vessel, which is called evaporation. The salt, thus deprived of the water, crystallizes, or hardens, and shoots into crystals, such as I shewed you the other day in the microscope. Opaque stones, pyrites, and minerals, when regularly formed, are said to be crystallized; as well as transparent stones and salts. Ice will give you the idea of a complete crystallization, composed of long needle-like masses, flattened
on

on one side, and joined together in such a manner, that the smaller are inserted into the sides of the greater. The crystals of different kinds of salts afford great variety and beauty of forms, and are curious objects of microscopic observation. The regularity of their figure, each different substance producing a form appropriate to itself, is a confirmation, that not only the more obvious works of nature, but also the internal structure of organized bodies, are formed with the same harmony, order, and beauty, that characterize the other parts of the creation. Marine salt is prepared by boiling sea-water. The salt-works are erected near the sea, in order to afford an opportunity of conveying the salt-water into them by pipes, which is afterwards boiled in pans of an immense size. It is necessary to have the roofs of wood fastened with wooden pegs, as the effluvia, which evaporates from the boiling pans, rusts and destroys iron in a very little time. Whilst boiling,

boiling, they purify it with whites of eggs, or sometimes the blood of sheep or oxen is used for the same purpose. The saline liquor which remains from the making of salt, is called bittern, and is used for medicinal purposes.

MRS. HARCOURT.

I think we may observe in the process of salt, as well as many other things, that nature provides materials for man's ingenuity and industry to work upon; nay, she supplies us with few things, that does not require some labour to render them suitable for our use.

MR. HARCOURT.

Nature has not only furnished us with materials to work with, but implanted in our minds such activity of disposition, and thirst of knowledge as impels us to scrutinize into the properties of these materials, and apply them to the purposes of life. Much has already been discovered, more perhaps lies still behind; the field is

H

vast,

vast, and may supply useful and interesting occupation for many succeeding generations of men. The third, and last kind of salt, is prepared in much the same manner as marine salt, from the water of salt wells and springs, and is called brine, or fountain salt. The whitest, driest, and finest grained salt is sometimes made up in form of sugar loves, in small wicker baskets. In preparing basket salt, they use resin, and other additions, to break the grain, and render it very small; and, to finish the process, it is dried in stoves. Great quantities of brine or spring salt is made in most of the inland countries, as in Germany, Switzerland, Hungary, and in some parts of France and England. Lakes of this kind are found in the Podo-tian desert, near the river Borysthenes; on the Russian frontiers, towards Crim Tary; in the kingdom of Algiers; and in other countries. Where nature does not supply these lakes or ponds, artificial ones

may

may be made. This is annually done very advantageously in France, where the chief coasts for bay-salt, are those of Bretagne, Saintonge, and the Pay d'Aunis. In order to make a saline, or salt-marsh, a low plat of ground must be chosen adjoining to the sea, and distant from the mouths of large rivers; and, to render it complete, it should be near some convenient harbour for vessels. The ground thus chosen, must be hollowed out to three ponds or receptacles. The first, into which the sea-water is admitted, may be called the reservoir; the second receptacle, which is to be again divided into three distinct ponds, communicating with each other by narrow passages, and containing brine of different degrees of strength, may be called the brine-ponds; and the third receptacle, is to be furnished with an entrance, between which and the brine-ponds, there is to run a long narrow winding channel, the rest of it is to be divided into small pits, containing a

very strongly saturated brine, which is to be converted into salt, and they may therefore properly be called the salt pits. The first receptacle must communicate with the sea, by a ditch, defended by walls; the ditch should have a flood-gate to admit, retain, or let out the sea-water, as occasion may require. The bottoms of the reservoir, or brine-ponds, are to be lined with any kind of tough clay, or earth, that will hold water. The proper season for making salt in these artificial salinæ, is from May to the end of August. When the salt-men open the flood-gate, at the time the tide is out, to drain off all the stagnating water, and after repairing and cleansing the receptacles from mud and dirt, they admit the sea-water, at the next high tide, till it floats the whole marsh, and stands at a proper height in the reservoir. In a few days, most of the water, in the salt-pits, is exhaled by the power of the sun, and what remains is a very strong brine.

brine. They daily supply themselves with more salt-water, in proportion to what is exhaled by the sun, and the workmen draw out the crystals, or salt, as they are formed every day, and dispose them in a pyramidal heap, which they cover over at the top with thatch, or straw, to preserve it from the injuries of the weather. Thus, at a small expence and trouble, a salt is prepared, very fit for all domestic uses; and France especially, is furnished with a very profitable article for exportation. The uses of common salt are various and extensive. Its acid and alkali are employed in many chemical operations in the arts. It is an important ingredient in the fusion of glass, which it whitens and purifies. It facilitates the fusion of the metallic parts of minerals; and its peculiar use in preserving meat, &c. and giving a poignancy to the taste of various kinds of food, is universally known. Common salt

is also useful as a manure, by contributing to fertilize the soil.

CHARLES.

You surprise me. I remember to have read in history, of princes, who commanded the lands of their enemies to be sowed with salt, that nothing might grow on them. The Bible furnishes me with an instance of it, when Abimelech destroyed the city of Shechem, he ordered the place where it had stood, to be sowed with salt.

MR. HARCOURT.

It pleases me to observe, that you remember what you read, and that you apply it as occasion offers. Perhaps the error and prejudice of the ancients arose from this cause, that they were ignorant that the salt is injurious, and destructive to all vegetables, yet it increases the fertility and productive qualities of the earth.

MRS. HARCOURT.

That is a very curious distinction, that

I was

I wa
late;
even

It
lated
cern
ing
child

SO
v
Ame
ignor
to be
quite
impr
house

I was unacquainted with before. It grows late; our lecture has been rather long this evening.

MR. HARCOURT.

It is time to separate, and as I have related the most important particulars concerning salt, and the manner of preparing it, we will withdraw. Good night, children.

CONVERSATION V.

AUGUSTA.

SOME gentlemen dined with us to-day, who came from Canada, in North-America. I believe they took me for an ignorant girl, that might easily be made to believe any thing. I assure you, they quite vexed me; they told me a number of improbable stories of an animal, that builds houses three stories high, makes bridges, and

and I know not what ridiculous stuff. I hate to be imposed upon, so I left the table as soon as the cloth was removed, and hastened here, to tell you how I have been served.

MRS. HARCOURT.

Sophia, what is the name of this extraordinary animal, that has caused so much offence to Augusta?

SOPHIA.

I suppose it was the beaver, mamma.

AUGUSTA.

Ay, that is the very name; but I cannot believe these accounts to be true.

MRS. HARCOURT.

Sophia, studies natural history, she shall give us the particulars she is acquainted with, concerning this curious creature.

MR. HARCOURT.

Charles has been this morning to inspect a hat manufactory, and is therefore prepared to complete his sister's account of the beaver, by informing us what use is

m de

made of its fur. Sophia, it is your turn to begin.

SOPHIA.

Beaver or Castor, makes a distinct genus of animals of the order of *Glires*, and class of *Mammalia*. The characters are, that the upper fore teeth are truncated, and hollowed obliquely, and that the lower are oblique at the apex; with a flat tail, and feet which have five toes on each, and palms adapted to swimming. Under this genus are comprehended three species. The Beaver or Fiber. Secondly, the Castor. Thirdly, the Castor, called *Zibethicus*.

MR. HARCOURT.

Very well defined, with the method and precision of a naturalist. Give us now a description of the animal, and afterwards, its manner of living and habits.

SOPHIA.

The Beaver is about four feet in length, and twelve or fifteen inches broad; his skin
in

in the northern regions is generally black; but it brightens into a reddish hue, in the temperate climates. He is covered with two sorts of hair, one long, and the other a soft down; the latter, which is an inch in length, is extremely fine and compact, and furnishes the animal with a necessary degree of warmth, the long hair preserves the down from dirt and wet. The head is like that of the otter, but longer, the snout is pretty long, the eyes small, the ears short, round and hairy on the outside, but smooth within, and the teeth very long, the under teeth project the breadth of three fingers, and the upper half a finger, all of which are broad, crooked, strong and sharp; besides those teeth, which are called incisors, which grow double, are set very deep in their jaws, and bend like the edge of an axe; they have sixteen grinders, eight on each side, four above, and four below, directly opposite to each other. With the former, they are able to cut down trees of a considerable

considerable size; with the latter, to break the hardest substances; the legs are short, the fore-legs not exceeding four or five inches in length, the fore-paws are formed something like the human hand. These feet serve the beaver to dig, soften, and work the clay for different purposes, the hind feet are furnished with membranes, or large skins, extending between the toes, like those of ducks, and other water-fowl; the tail is long, a little flat, entirely covered with scales, supplied with muscles, and perpetually moistened with oil or fat, which the creature distributes all over them with his snout, and which he procures from four bags, which are placed under the intestines, and are found in every beaver, whether male or female. These bags are filled with a resinous liquid substance, which, when it is ejected, settles into a thick consistence. Physicians call it castoreum, and prescribe it as an excellent remedy against poisons, vapours, and other maladies; but when

when it grows old, it blackens, and degenerates into a dangerous poison.

MRS. HARCOURT.

Before Sophia relates the manners and occupations of this creature, let us give particular attention to the implements nature has furnished it with. The form and strength of the teeth are suited to cutting of wood and hard substances, and we have already been told that with these they are able to fell trees; the fore-paws are adapted to handling and disposing the materials of the work; the hind-feet are formed for swimming, and evidently shew that the creature is intended to live in both elements, and is what is called an amphibious animal; the tail, from its flatness, and the hardness of its scales, may serve very well for a hod, such as bricklayers use for carrying mortar, &c. And now, Augusta, do you think it totally improbable, that a creature furnished with such tools, and endued with a proportionable degree of sagacity to use them,

them, should be able to construct houses of three stories, or build bridges, &c.?

AUGUSTA.

Indeed I begin to be staggered; but is this really the case? Pray Sophia go on, for I am impatient to hear what you have to tell us about it.

SOPHIA.

When they are going to chuse a place to build a habitation, they assemble in companies sometimes of two or three hundred, and after mature deliberation, fix on a spot where plenty of provisions, and all necessaries may be found. Their houses are always situated in the water, and when they can find neither lake nor pond adjacent, they endeavour to supply the defect, by stopping the current of some brook or small river, by means of a causey or dam; for this purpose they set about felling of trees, which several of them together effect pretty easily, with their strong teeth; they take care to chuse out those that grow

I

above

above the place where they intend to build, that they may swim down the current. They also, with wonderful sagacity, contrive that they shall fall towards the water, that they may have the less way to carry them. After the tree is felled, they cut it into proper lengths, and then roll them into the water, and navigate them towards the place where they are to be used. The causey, raised with these pieces of wood, is sometimes ten or a dozen feet in thickness at the foundation; it descends in a slope on the side next the water. The opposite side is raised perpendicularly like our walls, and the slope, which at its base, is twelve feet broad, diminishes towards the top to the breadth of two feet. They drive the extremities of these pieces of wood very near each other, into the earth, and interlace them with other flakes more slender and supple. But as the water, without some other prevention, would glide through the cavities and leave the reservoir dry, they

have

have recourse to a clay, which they perfectly well know how to procure, and which they work up into a kind of mortar with their tails, and close up the interstices with it, both within and without, and this entirely secures the water from passing away. If the violence of the water, or the footsteps of hunters, who pass over their work, damage it, they immediately set about repairing it. They build their cabins, either on piles in the middle of the small lakes, they have thus formed, on the bank of a river, or at the extremity of some point of land, that advances into a lake. The figure of them is round or oval, divided into three partitions, raised one above another. The first is sunk below the level of the dike, and is generally full of water, the other two stories are built above it. The whole edifice is mostly capable of containing eight or ten inhabitants. Each beaver has his peculiar cell assigned him, the floor of which he strews with leaves,

or small branches of the pine tree, so as to render it clean and comfortable. Their works, especially in the cold regions, are completed in August or September; after which they furnish themselves with a store of provisions. During the summer, they regale upon all the fruits and plants the country produces. In the winter they eat the wood of the ask, the plane, and other trees, which they steep in water, in quantities proportionable to their consumption, and they are supplied with a double stomach, to facilitate the digestion of such solid food, at two operations. They cut twigs from three to six feet in length, the larger ones are conveyed by several beavers to the magazine, and the smaller by a single animal, but they take different ways. Each individual has his walk assigned him, to prevent the labourers from being interrupted in their respective occupations. These parcels of wood are not piled up in one continued heap, but laid across one another with interstices

terstices between them, that they may the easier draw out what quantity they want; and they always take the parcel at the bottom. They cut this wood into small pieces, and convey it to their cell, where the whole family come to receive their share. Sometimes they wander in the woods, and regale their young with a fresh collation. The hunters, who know that these creatures love green wood, better than old, place a parcel of the former about their lodge, and then have several devices to ensnare them. When the winter grows severe, they sometimes break the ice, and when the beavers come to the opening for air, they kill them with hatchets, or make a large aperture in the ice, and cover it with a very strong net, and then overturn the lodge, upon which the beavers thinking to escape in their usual way, by flying to the water, and emerging at the hole in the ice, fall into the snare, and are taken.

CECILIA.

Poor creatures! what can induce any body to be so cruel, as to ensnare and destroy such ingenious and industrious animals?

MR. HARCOURT.

Profit. The hunters in America catch vast numbers of them every year, for the sake of their skins, and bags of castor, which they bring to the merchants, who send them to Europe.

CECILIA.

Pray what use do they make of their skins?

MR. HARCOURT.

I leave Charles to answer that question.

CHARLES.

Men's hats are made of the fur of the Beaver. Women are employed by the hatters, to clear the skins of the hair; for which purpose they use two knives; a large one, like a shoe-maker's knife, for the long hair; and a smaller, not unlike a vine knife,

to shave or scrape off the short hair or down. When the hair is off, they mix the stuff, putting to one third of dry castor, two thirds of old coat, a term they use for the hair of those skins, which have been worn some time by the savages, and by that means is become finer than the rest. After it is mixed, they card it; which is pulling it smooth and even, between two things resembling a curry-comb, with fine teeth: such as are used to card wool with, before it is spun. They then take a proper quantity of this stuff for a hat, and put it upon the hurdle, which is a square table with chinks cut through it lengthwise, then the workman takes an instrument called a bow, very like a fiddle-stick, and works the fur, till it mixes well together, the dirt and filth passing through the chinks. In this manner they form two gores or pieces of an oval form, ending in a sharp corner at top. These pieces, or capades, as they are called, being formed in this manner,

manner, they proceed to harden them into closer, and more consistent flakes, by pressing them with a hardening skin or leather; they are then carried to the bafon, which is a sort of bench, with an iron plate fitted in it, and a little fire underneath it, upon which they lay one of the capades, sprinkled with water, and make use of a sort of mould to form it; when, by means of the heat of the fire, the water, and pressing, the substance thickens into a slight hairy sort of felt or stuff. After they have turned up the edges all round the mould, they lay it by, and proceed in the same manner with the other half. The next thing is to join the two pieces together, so as to meet in a point at the top, and form a high crowned cap. The hat thus bafoned, is removed to a large receiver or trough, which is a kind of copper kettle, of a peculiar shape, filled with hot water and grounds, after dipping the hat in the kettle, they begin to work it, by rolling and unrolling
it

it again and again, first with their hands, and then with a little wooden roller, dipping it frequently in the kettle, till by fulling and thickening it in this manner for four or five hours, it is brought into the size of the hat intended; they form the crown by laying the high crowned cap on a wooden block of a proper size, and tying it round with a packthread, called a commander, which they gradually push down to the bottom of the block, with a piece of iron properly bent, which they call a flamber. When the hat is dried, they singe it, and rub it with pumice, to take off the coarser knap, it is afterwards rubbed with seal-skin, and lastly carded with a fine card.

MR. HARCOURT.

You have given us a very clear account of what you saw this morning; but pray tell us, whether something is not to be done to colour and stiffen the hat.

CHARLES.

CHARLES.

O yes! the hat is sent upon the block to the dyers, who makes a dye of logwood, verdigrease, copperas, and alder-bark, and fills his copper with it, which is mostly large enough to hold ten or twelve dozen of hats at a time. He boils the hats in this dye for near an hour, then sets them out to cool, and boils them again ten or more times over, till the dye is complete; it is now returned to the hatter, who dries it thoroughly over a charcoal fire, and then smears it with glue, or gum senegal, dissolved to stiffen it. The next thing is to steam it on the steaming-bafon, which is a little hearth or fire-place, covered over with an iron plate that exactly fits it; on this plate, wet cloths are spread to prevent the hat from burning, the hat is placed brim downwards on it, and rubbed gently with the hand, till sufficiently steamed and dried, it is then put again upon the block, and brushed and ironed with flat-irons, such

such as are used for ironing linen, which smoothen and polishes it, and nothing now remains to be done, but to clip the edges, and sew a lining into the crown.

MRS. HARCOURT.

I thank you in the name of the company for the entertainment you have given us, and cannot help observing the wisdom of Providence that has so wonderfully suited the formation and instincts of the beaver to its wants, and appointed manner of life.

AUGUSTA.

I am all astonishment and wonder; and for the future, shall be more ready to listen to extraordinary things with attention; but I thought it foolish to give credit to any thing that seemed so improbable.

MRS. HARCOURT.

There is a material difference between credulously assenting to every thing we hear without examination; and listening attentively to the relations of people of sense
and

and credit, who have no motive for imposing upon us; and, who, if we have patience, will probably give good reasons for what they assert; but it is a mark of ignorance to believe every thing implicitly. Much depends upon the degree of credit due to the character of the person who relates the circumstance: but there are such wonders in both nature and art, that till they are explained, may well appear improbable to the uninformed mind; this reflection should incite us to pursue the attainment of useful knowledge by attending to the conversation of people of experience and information.

MR. HARCOURT.

Conversation is an agreeable means of instruction: and those people, who by a habit of attention and observation, collect knowledge wherever it is to be found, may meet with it from the most clownish rustic, or unlettered mechanic. Never despise any body as too mean to learn from; but talk

to

to every one in his own way; that is, on the subject of his profession or calling, and you may with certainty rely upon gaining information.

MRS. HARCOURT.

We have passed the time so pleasantly, that we have not been aware how late it is; it is time to take leave. Children, good-night.

CONVERSATION - VI.

MRS. HARCOURT.

Business prevents your father from his usual attendance, therefore we must find something to entertain ourselves with; cannot we contrive some game or play to amuse us?

SOPHIA.

If you please, mamma, we will play at questions, in the manner Miss Groves

K

shewed

shewed us. You must propose a question, which each of us must try to answer in turn. Whoever gives a proper reply gains a prize.

CECILIA.

What shall the prizes be?

CHARLES.

They need not be of any great value, some trifle for the sake of the play.

MRS. HARCOURT.

I received a present yesterday, of some shells and fossile productions, it will give me pleasure to distribute them among you; they will just suit the purpose. Sophia, you will find them in my cabinet: bring them, and dispose them in equal parcels.

SOPHIA.

What beautiful tints! what colours can equal these? Shells, flowers, and insects are the finishings of nature, and for elegance of form, variety, and beauty of colour, as well as delicacy of texture, excel the finest works of art.

Mrs.

MRS. HARCOURT.

They will serve two purposes. The one as prizes for your answers, the other as a subject for my first question. What is a shell?

HENRY.

A shell is a house for a snail, or a small fish to live in.

MRS. HARCOURT.

A prize belongs to Henry for his answer, as it is certain that shells furnish a case or covering, or if you please a habitation, for the insects that dwell in them; they also serve them as a defence, or coat of mail against their enemies, or any thing that might injure their tender bodies; but I mean to enquire in what manner the shell is produced.

CECILIA.

I suppose it is a part of the animal, formed with it as bones are.

MRS. HARCOURT.

That was thought to be the case for-

merly, but the discoveries of M. Reaumur has shewn the supposition to be false; he has proved that the shells of snails are formed from the perspiration of the animal, which is concreted or hardened by the air, and it is reasonable to suppose that the seawater has the same effect on those of fishes. The casting of the shell of crabs and lobsters tends to confirm this opinion.

AUGUSTA.

Do they ever change their shells?

MRS. HARCOURT.

Yes, my dear, every year. The creature, aware of what it has to undergo, retreats to a place of security, such as the cavities of rocks, or under great stones, where it lies till all the parts are by degrees disengaged from the old shell. In this naked state they make a very disagreeable appearance, being a mere lump of flesh covered with a sort of jelly, which by degrees hardens into a shell, somewhat larger than the old

old one, and thus accommodates itself to the growth of the animal.

CHARLES.

This is very wonderful indeed; are shells a perfect defence to the fish that live in them?

MRS. HARCOURT.

I propose that as my next question, to be answered by the company.

SOPHIA.

I suppose there is no manner of doubt, as mamma has already told us, that they defend the fish against many injuries; but I read a little while ago, they are not a perfect security against all. Shell-fish are the food of some fish of the larger kinds, particularly the sea-porcupine, and a species of the wray-fish, feed chiefly upon them. These fish are provided by nature with a suitable apparatus for grinding them into a state proper for digestion, their jaws being furnished with bony substances extending to the palate, and under part of

the mouth, which are capable of reducing strong shells into a pulp; but what is most extraordinary is, that a small *pectunculus* or cockle, is the prey of the foal, which has no such instruments for breaking them to pieces, but is supposed to be furnished with a menstruum in the body, that has the power of dissolving them; for on examining the inside of a foal, many of these shells are found in part dissolved, whilst others remain unaltered.

MRS. HARCOURT.

How various are the powers of nature; she is not obliged to perform the same thing always by the same means, but uses variety of processes to produce the same effect. Into how many classes are shells divided by the best naturalists?

CHARLES.

A visit to the British Museum, in company with a friend of my papa's, who is a collector of shells, has rendered me capable of resolving that question: they are generally

rally
bivalv
sea, la
subdiv
The
one f
cond,
as the
those
Sea-e
these,
Land
and th
are in
fossile
suppo
seas, t
tities
far di
on the

As
could

rally divided into three classes. Univalves, bivalves, and multivalves; which include sea, land, and fresh-water shells, which are subdivided into many genera and species. The first class consists of shells that are of one single piece; as a snail-shell; the second, of those which are formed of two, as the oyster or muscle; and the third, of those which have more pieces than two. Sea-eggs will afford us an example of these, being covered with spines or prickles. Land-shells are of two kinds, the recent and the fossil; the recent are those which are inhabited by living animals; but the fossil are the remains of marine bodies, supposed to have once inhabited the deep seas, though frequently found in great quantities under ground, in mines, and in places far distant from the ocean, and sometimes on the tops of mountains.

AUGUSTA.

Astonishing! by what strange accident could they ever come there?

CHARLES.

CHARLES.

That question has puzzled many wise and learned men; it is generally believed that those parts have many ages ago been covered with sea, and some refer to the grand deluge as the cause of this wonderful change; they are very advantageous to the places where they are found, as they afford an excellent manure for land.

SOPHIA.

This is a convincing proof of the truth of the history of the deluge: the account that Moses gives us of the flood has always appeared to me so wonderful, that I could scarcely believe it; but I think, after this confirmation, I shall never doubt again concerning any thing, however extraordinary, that I find written in the Scriptures.

MRS. HARCOURT.

Remember, my dear, that the sacred writings contain a history of the miraculous interposition of divine Providence, in teach-

ing

ing mankind the most holy and pure religion, from the earliest ages to the glorious dispensation of the Gospel. Can we then be surprised, that they should contain things out of the course of nature? the very essence of a miracle is, that an effect is produced which can only be accounted for by the influence of a supernatural power. In the rude ages of gross ignorance, when the worship of idols was almost universal, some striking instances of a miraculous display of divine power was necessary to convince men, that a God existed, who had created all things, and who governed them with an all-seeing eye. The children of Israel were chosen as a peculiar people, among whom was displayed these extraordinary manifestations of the divine Presence, that by their means the worship of the One True God might supplant the adoration paid to the sun, moon, stars, animals of various kinds, and even to stocks and stones, by the different nations of the earth. The
multitude

multitude of fossile bodies found in places remote from the sea are an incontrovertible proof of some violent convulsion of nature, and perhaps are permitted to remain as a monument, to silence all cavillers on this subject; but let us resume the thread of our discourse, the vast variety of shells that are seen in the cabinets of collectors is not all the produce of one sea or one country. Some of the most beautiful come from the East-Indies and the Red-Sea. The colours and brilliancy of shells seem to be improved and heightened by the heat of the sun, as those of warm climates always excel those found in cold countries in lustre. The shores of Asia furnish us with the pearl-oysters and scallops in great perfection. Shells of great beauty are also found on the shores of America and the West-Indies. In Africa, on the coast of Guinea, abounds a small species of porcelain shells, which the natives use as money.

AUGUSTA.

AUGUSTA.

I thought nothing could serve the purpose of money but gold and silver.

MRS. HARCOURT.

Gold and silver are only used as a representation of real wealth. I give you a certain quantity of gold, in exchange for which you supply me with corn, cattle, or any of the necessaries of life. With the gold that you have received, you purchase some other commodity that you want from a third person, who likewise barter it in the same manner for something that he stands in need of; thus it passes from one to another, enabling them to exchange the commodities of life in a more exact proportion with respect to the value of each, than could be done without such a medium. Shells, or any other durable substance, may answer the same purpose as gold, if men agree to receive it in the same way. The women of this country adorn their hair, and make bracelets and necklaces
with

with another kind, which are perfectly white.

HENRY.

How droll they must look upon their black faces and necks.

SOPHIA.

We have different ideas of beauty, Henry, perhaps they are as well satisfied with these simple ornaments, as our women of fashion are with diamonds and rouge, but we interrupt mamma.

MRS. HARCOURT.

The Mediterranean and Northern Ocean contain great variety of shells, and many of remarkable elegance and beauty; but upon the whole they are greatly inferior to those of the East-Indies. Our own English coasts are not the last in the production of shells, though they cannot be compared to those of the East-Indies for lustre and colour.

CECILIA.

I think I have heard that there is a method

thod
be so

The
shells,

Amor

which

out of

their

proved

tints

the na

be giv

conce

the ha

Collec

same f

the na

withth

of natu

would

were i

veils, a

thod of polishing shells, mamma, will you be so kind as to tell us how it is done.

MRS. HARCOURT.

There are various methods of polishing shells, and adding to their natural beauty. Among the immense variety of shells, with which we are acquainted, some are taken out of the sea, or found on its shores, in their utmost perfection, and cannot be improved by the hand of art, their beautiful tints being spread upon the surface, and the natural polish superior to any that could be given: but in others the beauties are concealed by a coarse outer coat, which the hand of a skilful polisher may remove. Collectors should have specimens of the same species both rough and polished, that the naturalist may compare the natural state with the artificial one. How many fine strokes of nature's pencil in this part of the creation would be entirely concealed from our view, were it not for the assistance of an art that unveils, and displays them in full lustre? A shell

L

that

that has a smooth surface, and a natural dull polish, requires only to be rubbed with the hand, or a piece of chamoy leather, or some tripoli or fine rotten stone may be used, and it will become perfectly bright and polished; but even this should be done with caution, for in many shells the lines are only on the surface, and the wearing ever so little of the shell defaces it. A shell that is rough, foul, and crusty, or covered with a tartareous coat must be steeped for some hours in hot water, then it is to be rubbed with rough emery on a stick, in order to get off the coat; after this it may be dipped in diluted aqua-fortis, spirit of salt, or any other acid, and after remaining a few moments in it, be again dipped in common water; then it is to be well rubbed with soap-suds; after which the operation may be finished with fine emery, and a hair-brush; and, many to heighten the polish, rub the shell with a thin solution of gum arabic, or the white of an egg; gloves should

should be worn in using the aqua-fortis, as it is liable to injure the flesh wherever it touches. Some shells require more severe treatment, which is called scaling them, and is performed by a horizontal wheel of lead or tin, impregnated with rough emery, and the shell is worked down in the same manner as stones are by the lapidary; this requires the hand of a skilful artist to avoid wearing away the shell too low, and spoiling it. After the shell is cut down as far as is proper, it is to be polished with fine emery, tripoli or rotten stone, with a wooden wheel, turned by the same machine as the leaden one. These are the principal means used in this art, and the changes that are produced by it, are often so great, that the shell is not to be known for the same; for instance, the onyx or volute is of a simple pale brown in its natural state, and becomes a fine bright yellow, with only just the superficies taken off, but if eaten away deeper, appears of a milk-

white, with a bluish hue towards the bottom. In the East-Indies they frequently engrave lines, circles, and other devices on many species of shells, particularly the nautilus; but this is a gross violation of good taste; so far from embellishing or heightening the charms of nature, it does not even imitate them.

CHARLES.

When we go to the sea-side in autumn, we may collect shells, and polish them at our leisure hours. Among other curiosities that were pointed out to my observation at the British Museum, was a piece of byssus, which is a fine cloth, used by the ancients, when silk was rare, made of the threads of the pinna marina, a fish somewhat like a muscle, but much larger, and is held in its place in the same manner, by a prodigious number of very fine threads, which the animal has the power of spinning as it finds occasion, as the spider and caterpillar do. These threads have in all

times

times been used for the same purposes as silk. At present they are manufactured at Palermo, the chief city of Sicily, and other places, into gloves, stockings, and different sorts of wearing apparel. The method of rendering it fit for use, is by laying it for a few days in a damp cellar to soften, then comb and cleanse it; and lastly, spin it, in the same manner as they do silk. By these threads, the pinna marina, or sea-wing, as it is sometimes called, suspend themselves to the rocks twenty or thirty feet beneath the surface of the sea. In this situation, it is so successfully attacked by the eight-footed polypus, that the species could not exist, but for the assistance of the cancer pinnotheris, which lives in the same shell, as a guard and companion. The pinnotheris or pinnophylax is a small crab, naked like Bernard the hermit, but is furnished with good eyes, and always inhabits the shell of the pinna; when they want food, the pinna opens its shell, and sends its faith-

ful ally to forage; but if the cancer sees the polypus, he returns suddenly to the arms of his blind hostess, who by closing the shell, avoids the fury of her enemy; otherwise, when it has procured a booty, it brings it to the opening of the shell, where it is admitted, and they divide the prey.

AUGUSTA.

This is curious indeed; that one animal should supply eyes for another, in return for the advantage of a coat of mail.

MRS. HARCOURT.

It is almost time to distribute the prizes. Henry, that small lot of beautiful shells belongs to you. Charles will take these pieces of coral, and prepare himself by to-morrow evening to give us some account of what coral is, whether animal or vegetable; and Sophia, this paper nautilus is reserved for you. I hope you are able to give us some particulars relative to the fish that inhabited it.

SOPHIA.

SOPHIA.

The general form of the nautilus is adapted to swimming on the water, and resembles the figure of a boat or vessel, but varies in some particulars in the different species. The name is derived from a Greek word, signifying both a fish and a sailor. It is supposed that men first took the idea of sailing in vessels from what they saw practised by this little creature. The paper nautilus, is so named from the thinness of the shell, which it sometimes creeps out of, and goes on shore to feed. When this animal intends to sail, it extends two of its arms on high, and supports a membrane between them, which it throws out to serve as a sail, and its two other arms hang out of the shell to be used occasionally as oars, or as a steerage; but this last office is generally performed by the tail. When the sea is calm, numbers of these fish are frequently seen diverting themselves with sailing about in this manner, but as soon as a storm

storm arises, or any thing disturbs them, they draw in their arms, and take in as much water as makes them a little heavier than the sea-water in which they swim, and by that means sink to the bottom. When they desire to rise again, they expel this abundant water through a number of holes which they have in their arms, and so lighten themselves.

MRS. HARCOURT.

The manners and instincts of those animals that inhabit the ocean, are greatly concealed from us by their situation, but those few that have offered themselves to our observation, display instances of the same admirable wisdom that has formed the inhabitants of the earth and air. Should man ever be enabled, by any future discovery to traverse the bottom of the sea, what wonders would be opened to his view! what numberless examples of contrivance and sagacity, directed by the same wisdom that has instructed the bee to gather honey,
and

and the beaver to construct his habitation, would appear! The different contrivances that several species of fish, whose manners are known, discover, in the modes of catching their prey, are so wonderful and curious, that I cannot deny myself the pleasure of relating a few instances. The sturgeon is without teeth, and his mouth placed under the head, like the opening of a purse, which he has the power of pushing suddenly out or retracting. Before this mouth, under the beak or nose, hang four tendrils some inches long, and which so resemble earth-worms, that at first sight they may be mistaken for them. This clumsy toothless fish is supposed by this contrivance to keep himself in good condition, the solidity of his flesh evidently shewing him to be a fish of prey. He is said to hide his large body amongst the weeds near the sea-coast, or at the mouths of large rivers, only exposing his irrihi or tendrils, which small fish or sea insects mistaking

mistaking for real worms, approach for plunder, and are sucked into the jaws of their enemy. The flesh of the sturgeon was so valued in the time of the emperor Severus, that it was brought to table by servants with coronets on their heads, and preceded by music, which might give rise to its being in our country presented by the lord mayor to the king. At present it is caught in the Danube, and the Wolga, the Don, and other large rivers, for various purposes. The skin makes the best covering for carriages; isinglass is prepared from parts of the skin, caviar from the spawn; and the flesh is pickled or salted, and sent all over Europe, as your father told you in his account of the fisheries. There is a sea insect described by Mr. Huges, whose claws or tentacles being disposed in regu'ar circles, and tinged with variety of bright lively colours, represent the petals of some most elegantly fringed and radiated flowers; as the carnation, marigold,

rigold,
serve
prey.
sensibly
night,

C
Go
to
party
Harco
ed wi
sils.

Not
to ren

Del
strong
pressio

rigold, and anemone; these beautiful rays serve them as a net for inclosing their prey. These entertaining subjects have insensibly led us on till it is late. Good night, children, let us retire.

CONVERSATION VII.

MR. HARCOURT.

GOOD evening to you, ladies, I regretted losing the pleasure of joining your party last night, but understand from Mrs. Harcourt, that you were very well amused with the subject of shells and fossils.

CECILIA.

Nothing was wanting but your company, to render our evening delightful.

MRS. HARCOURT.

Delightful, my dear Cecilia, that is too strong a word; learn to moderate your expressions, suit your terms to the occasion;
or

or you will be at a loss to raise your language in proportion to your feelings, when important events excite your liveliest emotions.

CECILIA.

How often do I forget your precepts in this respect, although I endeavour to attend to them; but I did enjoy myself so very much last night, that I thought I might say delightful without any exaggeration.

MRS. HARCOURT.

I am glad you were so well pleased; but restrain the warmth of your expressions; an excess in this way, may be ranked among the follies of the present fashionable manners; it is not only absurd in itself, but tends to give us false ideas of things, and induces us to consider that as important, which in its own nature is but trifling. Whenever I hear a girl exclaim upon every little variation of weather, I am dying of heat, I am frozen to death;

death; or melting in ecstasies at a concert or a play, I suspect either that her imagination has been suffered to run wild, or that she has never been instructed to adapt her language to her ideas. Such excess of speech is to be expected from novel and romance readers, but are ill suited to a woman of good sense and propriety of manners.—Well, Charles, we expect our entertainment from you, to-night. Have you been able to discover, whether corals and corallines are to be ranked in the vegetable or animal kingdom?

CHARLES.

Linneus has classed them among the zoophytes, which are a kind of intermediate body, supposed to partake both of the nature of an animal and a vegetable, as the Greek words, from which it is derived, indicate, signifying plant animal. In the Linnean system, the zoophytes, which constitute the fifth order of worms, are compo-

M

site

sive animals, resembling flowers, and springing from a vegetating stem. This order contains fifteen genera, of which nine are fixed, and have no power of removing from the places where they are formed; as the isis or red coral, sea-fan or gorgonia, alcyonium, sponge, flustra, tubularia, corallines, sertularia, and vorticella; but the others possess the faculty of transporting themselves from one place to another, as the hydra or polype, the pennatula or sea-pen, toenia, volvox, furia, and chaos, or the assemblage of chaotic or microscopical animals. The species under this order are one hundred and fifty-six. The immense and dangerous rocks built by the swarms of coral insects in the Southern Ocean, which rise perpendicularly like walls, are described in Cook's voyages. A point of one of these rocks broke off, and stuck in the hole that it had made in the bottom of one of his ships, which must other-

wise

wife
waterT
ages
lime
gerie
which
earth
seen
port
and
shire
foun
of th
eithe
no l
come
can
cora
cure

T

wife have perished, by the admission of water.

MR. HARCOURT.

Their prodigious multiplication in all ages of the world is shewn by the numerous lime-stone rocks, which consist of a congeries or heap of the cells of these animals, which constitute a great part of the solid earth. Specimens of these rocks are to be seen in the lime-works at Linsell, near Newport, in Shropshire; in Coalbrook Dale; and in several parts of the Peak of Derbyshire. It is remarkable that many of those found in a fossil state, differ from any species of the recent ones that are known, and have either been produced in the deep seas, where no human eye can penetrate, or are become extinct. I suppose, Charles, you can inform us from what country the best coral comes, and in what manner it is procured.

CHARLES.

The season for fishing coral is from April

to July. The places are the Persian Gulf, Red Sea, coasts of Africa, towards the Bastion of France, the isles of Majorca and Corsica, and the coasts of Provence and Catalonia. Seven or eight men go in a boat: the caffer throws the net, which is formed of two beams, tied across with a leaden weight to press them down. A great quantity of hemp is loosely twisted round, among which they mix some strong nets, and fasten to the beams; thus prepared it is let down into the sea, and when the coral is pretty much entangled, they draw it out by a rope, which sometimes requires half a dozen boats to effect. It is used as a medicine in various diseases.

SOPHIA.

I suppose it is but lately that the real nature of coral has been ascertained; was it not formerly reckoned a vegetable?

MR. HARCOURT.

It was formerly ranked among the number of marine plants, but the discoveries of modern

moder
king
torily
bitati
ed fo
natur
much
know
and
sea a
from
grav
when
conv
that
botto
prob
mon
conf
kind
rine
labor

modern naturalists have raised it to the animal kingdom, since their observations satisfactorily prove that it is the structure and habitation of certain sea animals, and designed for their protection and support. The nature and origin of coral have been as much disputed as any subject in natural knowledge. Some have considered coral, and the other similar productions of the sea as stone. They adopted this opinion from their excessive hardness, and specific gravity, as well as from observing that when these bodies were calcined, they were converted into lime. Kircher supposes that there are entire forests of it at the bottom of the sea, which is not at all improbable, since M. de Peyssonnel has demonstrated by his experiments, that it is constructed by an animal of the polype kind. In forming coral, and other marine productions of this class, the animal labours like those of the testaceous kind,

each according to its species, and their productions vary according to their several forms, magnitudes, and colours. The coral insect, he observes, expands itself in water, and contracts itself in air; or when it is touched with the hand, or when acid liquors are poured upon it; and he actually saw these insects move their claws or legs, and expand themselves, when the water in which they were, was placed near the fire. Broken branches of coral have been observed to fasten to other branches. The coral insects, not having been injured, continue their operations, and as they draw no sustenance from the stone of the coral, they are able to increase in a detached state. M. de Peyssonnel observed that it grows in every direction, sometimes horizontally, sometimes perpendicularly downwards, at other times upwards. Coral then is a mass of animals of the polype kind, having the same relation to the polypes united to them, that there is between the shell of a snail,
and

1

and the snail itself. Pray Charles, tell us how many kinds of coral there are?

CHARLES.

There are three kinds; red, white and black; the black is the rarest, and most esteemed; but it is the red that is mostly used in medicine. There is no part of the world where white coral is produced in such abundance as on the shores of the island of Ceylon, and other of the neighbouring coasts. The lime made in those countries for building houses, fortifications, &c. is all prepared by burning this coral. It lies in vast banks, which are uncovered at low water, and it is spongy and porous. While young, it is formed erect in shape of little shrubs, and is then firm and solid, with a smooth surface; but the branches continually shoot out, and from those new branches, proceed others, till the whole is one confused bush, which is all covered with a white viscous matter, which in time hardens upon them, and becomes

becomes coral; and this filling up all the interstices, and hardening between them, renders it one coarse rock.

CECILIA.

I observed you named sponge among the zoophytes; surely that cannot be the habitation of insects. I have often wondered what it is, but have never been able to satisfy my curiosity.

MR. HARCOURT.

Sponge is a kind of marine substance, found adhering to rocks, shells, &c. under cover of the sea-water. Naturalists have till lately been greatly embarrassed in which of the three kingdoms to place it; but it is now decidedly allowed to be of some species of worm or polype. The same M. de Peyssonnel has discovered, and described the worms that form four different species of spuoges; he thinks the sponge is formed from the juice or slaver, which is deposited by the worms that inhabit them.

HENRY.

HENRY.

The next time I have any to rub my slate with, I will try if I can find any of these insects.

MRS. HARCOURT.

It will be a vain endeavour. The insects are all dead, long before the sponge comes to our hands; besides they are so small as to require the best microscopes to discover them.

AUGUSTA.

I know a lady that has a beautiful grotto in her garden; ornamented with variety of corals and shells. I shall observe it with more attention the next time I visit her.

CHARLES.

I wonder any body should bestow the money and trouble, necessary to form such a collection, to place them in a garden, where they are liable to be stolen, and are exposed to the injuries of the weather.

SOPHIA.

SOPHIA.

Perhaps the corals are artificial, and ordinary shells, mixed with pebbles, and pieces of coloured glass; the refuse of the glass-house, would have a very pretty effect.

CECILIA.

Artificial coral! I never heard of such a thing. Pray sister, how do they make it?

SOPHIA.

After having chosen twigs and branches to your fancy, resembling the manner of the growth of coral as much as possible; you must peel and dry them. Then take one ounce of clear rosin, and dissolve it in a brass pan, to which add two drams of the finest vermilion, mix these ingredients well together, and paint the branches with it whilst it is warm, then hold them over a gentle coal fire, till they are smooth and even as if polished. In the same manner,
white

white coral may be imitated with white lead, and black coral with lampblack.

CHARLES.

If papa and mamma will give us leave, we will build one, near the river at the top of the grove. I will undertake to be the architect, and perform the rough work.

MRS. HARCOURT.

I approve the plan, and will assist in the execution of it.

MR. HARCOURT.

I agree to it, on one condition, that it shall not infringe upon the time of your studies. Rise an hour earlier every morning, that will give you sufficient opportunity for the work.

CECILIA.

That will be no hardship, these beautiful mornings; let us agree to meet at six o'clock.

AUGUSTA.

I am not used to rise till eight. How shall I ever contrive to be ready?

HENRY.

HENRY.

I will rouse you, by ringing of the bell.

MRS. HARCOURT.

Late rising is a bad habit, that you have been allowed to contract; but my dear Augusta, determine to overcome it; it will require a little resolution at first, but when you consider the advantages it will procure, I am persuaded the difficulty will appear trifling. Health and opportunity for improvement, result from an early hour; a pale face, languor, and slothfulness, are the penalties of lying long in bed. A too great proportion of sleep is equally a species of intemperance with gluttony and drunkenness, and yet many a person, who would shudder at being accused of those depravities, freely indulge themselves in the former, from want of consideration, ill example, and long habit; and by that means injure their constitution, and lose a large portion of the active part of their lives.

lives.
may be
ing you
when o
you wi
able.

You
tage of
to be o
has lat
that wa
that the
found i
quire t
came th
the fish

Man
ancient
produ
ed the
fish, bu

lives. Perhaps the building of this grotto may be the fortunate means of accustoming you to wake at a proper hour, and when once you have used yourself to it, you will find it both pleasant and profitable.

AUGUSTA.

You have convinced me of the advantage of rising early, and I shall endeavour to be one of the first at the grove. Papa has lately given me a fine pearl necklace that was mamma's: my governess tells me that they are not beads, but that they are found in oysters. I thought I would enquire the next time we met, how they came there, as I suppose they are no part of the fish.

MR. HARCOURT.

Many have been the conjectures of both ancient and modern writers concerning the production of pearls. Some have supposed them to proceed from a disease of the fish, but there seems to be a great simi-

N

larity

larity between them, and what is found in crabs, called crabs-eyes, which are formed near the stomach of the animal, and serve as a reservoir of calcareous matter against the forming of the new shell, at which time they are dissolved, and deposited for that purpose. As the internal part of the shell of the pearl, oyster, or muscle, consists of mother pearl, which resembles the material of pearl, and as the animal has annually occasion to enlarge his shell, there is reason to suspect that the loose pearls are similar reservoirs of the pearly matter for that purpose. The fish, in which the pearls are found, is much larger than the common oyster, and is called *concha margaritifera*. It abounds on the coast of Persia, near Ormus, about Cape Comorin, and on the coast of the island of Ceylon. The oriental pearls are most valued on account of their largeness, colour, and beauty; but pearls are caught in the seas of the East-Indies, in those of America, and in some parts of Europe.

Europe. At the commencement of the season, which is in March and April, and again in August and September, there appear frequently two hundred and fifty barks on the banks; in the larger are two divers; in the smaller, one. Each bark puts off from shore before sun-rise, by a land-breeze which never fails, and returns again by a sea-breeze, which succeeds it at noon. As soon as the barks have arrived at the place where the fish lie, and have cast anchor, each diver binds a stone under his body, which is to serve him as ballast, and prevent his being driven away by the motion of the water, and also to enable him to walk more steadily among the waves. Besides this they tie another heavy stone to one foot, in order to sink them to the bottom of the sea: and as the oysters adhere strongly to the rocks, they arm their fingers with leather gloves, or take an iron-rake to displace them with. Lastly, each diver carries with him a large net, tied to

his neck by a long cord, the other end of which is fastened to the side of the bark. The net or sack is intended to hold the oysters he may collect, and the cord is to pull him up by, when his bag is full, or when he wants air. Thus equipped, he precipitates himself sometimes above sixty feet under water. As he has no time to lose, as soon as he arrives at the bottom, he begins to tear the oysters off the rocks, and cram them into his budget. At whatever depth the divers are, the light is sufficient for them to see what passes around them, and sometimes, to their great consternation, they behold monstrous fishes, from whose jaws they can escape only by mudding the water, and concealing themselves by that means; although this artifice will not always save them from falling a prey to these formidable enemies. The best divers will remain under water near half an hour, during which time they hold their breath, without the use of oils, acquiring the

the h
tion is
lives
Beside
way o
trived
air, by
up an

The
to ob
pearls
more
fishern

The
dange
how t
itself,
gain b
sold f
patra,
ing, th

the habit by long practice; but the exertion is so violent, as generally to shorten the lives of those who repeat it frequently. Besides this method of diving, there is a way of descending in a diving bell, so contrived as to be replenished often with fresh air, by means of air-barrels, which are let up and down by ropes.

SOPHIA.

The dangers that the poor diver incurs, to obtain a mere bauble, for I suppose pearls are only used for ornaments, are far more dreadful than those of the Greenland fishermen.

MRS. HARCOURT.

The poor men, who encounter these dangers for a livelihood, do not consider how trifling the value of the pearls is in itself, but what great advantages they can gain by the risk. Single pearls have been sold for immense sums of money. Cleopatra, queen of Egypt, wore one as an earring, that Pliny has estimated at eighty thou-

land pounds sterling. The real value of pearls and diamonds is small, because they do not contribute to the support or comfort of the life of man; but whilst people of fortune will lavish great sums upon such insignificant things, there will always be found people whose necessities will impel them to obtain them at the risk of their lives. It is time to separate. Remember our appointment in the grove at six to-morrow morning.

CONVERSATION VIII.

MR. HARCOURT.

WELL ladies, how have you proceeded with your grotto? though I am not one of the party, I am interested in your success.

SOPHIA.

We go on very well indeed, Charles has drawn the plan, and mamma has given
James

James
founda
ployed
and fo
collect
ed by
to put
making
a share
mise u
if you
curing
the fur

Mos
that, o
to forw
of you
is comp

I thi
princip
salt and

James leave to help my brother to dig the foundations; Augusta and Cecilia are employed in sorting and cleaning the shells and fossils; they also have undertaken to collect pebbles, and gather mosses, attended by little Henry, who carries a basket to put them in; and I am very busy in making artificial coral; thus we all take a share. Mamma is so-kind as to promise us a present of shells and ores, and if you please, you must contribute, by procuring us some glass cinders, or refuse of the furnaces from the glass-house.

MR. HARCOURT.

Most willingly shall I supply you with that, or any other thing you may want, to forward your design; but pray, can any of you inform me, of what ingredients glass is composed?

CHARLES.

I think, Sir, you have told me that the principal articles in its composition are salt and sand, or some kind of stone which
answers

answers the same purpose; the salt must be of the fixed kind, such as will not evaporate with the most intense heat, and is generally procured from the ashes of a vegetable called kali, which is brought from the Levant. The sand or stone, must be such as will melt easily, which gives firmness and consistence to the glass.

MR. HARCOURT.

The best stone for this purpose, comes also from Italy, and is called tarso. But sand is now almost the only substance employed in the British manufactures of glass. The most suitable is that which is white, small, and shining: when examined by the microscope, it appears to be fragments of rock crystal; that which is of a soft texture, and more gritty, does very well for green glass. Our glass-houses are furnished with white sand for their crystal glasses, from Lynn in Norfolk, and Maidstone in Kent; and with the coarser, for green glass, from Woolwich; other ingredients are occasionally

casionally mixed with these, according to the kind of glass required, such as arsenic, manganese, lead, &c.

MRS. HARCOURT.

Sophia, you have seen a glass-house, cannot you give some account of the operations performed there?

SOPHIA.

There are three sorts of furnaces used in the glass-works. After having properly mixed the ashes and sand together, they are put into the first furnace, where they are burned or calcined for a sufficient time, and become what is called frit, which being boiled in pots or crucibles of pipe-makers clay, in the second furnace, is rendered fit for blowing.

AUGUSTA.

How very extraordinary that materials of so gross and dirty a nature, should ever become so beautiful and transparent as glass! By what is the alteration occasioned?

MRS.

MRS. HARCOURT.

The metamorphosis, for it may well be termed so, is caused by the action of the fire, which when intense, vitrifies or turns them into glass. Sophia, go on with your account.

SOPHIA.

The workman, who blows the glass, takes his blowing iron, which is a hollow tube about two feet and a half long, and dipping it in the melting-pot, turns it about: the metal sticks to the iron like honey: he dips four times for every glass, and at every dip, rolls the end of his instrument, with the glass on it, on a piece of iron, over which is a vessel of water, which by its coolness consolidates the glass, and disposes it to bind better with the next to be taken out of the pot. When he has got enough of matter on the instrument, he begins to blow gently through it, in the same manner as boys blow soap-suds through a pipe, and in order to give it a polish, he rolls it back-wards

wards
after
he has
shape,
man to
tle pie
to hol
in an
with a
enlarg
is set i
or hard
and th
each a

Hab
men to
they re
and lu
work i
straw-h
eyes fr
They si

wards and forwards on a stone or marble: after blowing, and whirling the iron till he has formed the glass to the intended shape, he delivers it to the master workman to break off the collet, which is a little piece that sticks to the iron. In order to hollow it out, another workman thrusts in an iron instrument, and turns it round with a circular motion till it is sufficiently enlarged. When it is perfectly formed, it is set in the lear or third furnace to anneal or harden; it is proper to add, that the stem, and the foot of a drinking glass, require each a distinct operation.

MRS. HARCOURT.

Habit and long practice, enable these men to endure these scorching heats, which they receive directly in their faces, mouths, and lungs. They are always obliged to work in their shirts, with a broad brimmed straw-hat on their heads, to preserve their eyes from the excessive heat and light. They sit in large wide wooden chairs, with
long

long elbows, to which their instruments are hung. They work for six hours without intermission, when they are relieved by another set of workmen, who take their places for the same space of time.

CECILIA.

Panes of glass for windows cannot surely be formed by blowing, pray how are they made.

MR. HARCOURT.

The workman contrives to blow, and dispose his glass so as to form a cylinder, which by frequently heating and working on a kind of earthen table, at length begins to open and unfold like a sheet of paper, a previous notch or incision being made for that purpose in the cylinder of glass, and thus becomes flat; the table of glass is now nearly perfected, and requires nothing farther, but to be heated over again. When taken out, they lay it on a table of copper,
from

from whence it is carried to the third furnace to anneal.

HENRY.

Pray explain the meaning of that word, I do not understand it.

MR. HARCOURT.

It signifies to bake or harden; the first furnace in a glass-house is heated to an intense degree of heat, in order to fuse or incorporate the ingredients; the second is also heated sufficiently to melt and vitrify the frit into a glassy substance; but the third is moderately heated, that it may perform the office of baking or hardening the work, when fashioned to the shape it is to bear.

HENRY.

You have explained this so clearly, that I am no longer at a loss to comprehend it.

MR. HARCOURT.

There are two methods of making plates for looking-glasses; the one, by blowing them,
Q much

much in the same manner as they blow glass for windows, but on a larger scale. The other, casting or running of them, which is generally practised in making large glasses. The French claim the honour of this invention. It was first proposed to the French court in 1688, by the Sieur Abraham Thevart. It is performed in nearly a similar manner to the casting of sheet-lead, and this method not only enables them to make glasses of more than double the size of any made by blowing, but also to cast all kinds of borders mouldings, &c. The furnaces for melting the materials of this manufacture are of enormous size, and those for annealing the glasses when formed, still larger. There are at least twenty-four annealing furnaces or ovens, each above twenty feet long placed around a melting furnace. All these furnaces are covered over with a large shed, under which are likewise built forges and workhouses for smiths, carpenters, and other artificers,

who

who
and
naces
and t
So th
Gobin
fonois
manu
than
The i
a fort
action
for me
are ab
they f
glass,
pots,
matter
settled,
in the f
excessiv
glass is
is a cu

who are continually employed in repairing and keeping in order the machines, furnaces, &c. as also apartments for these, and the workmen employed about the glass. So that the glass-house in the castle of St. Gobin, in the forest of Fere, in the Soissonois, celebrated for its excellence in this manufacture, appears more like a little city, than an assemblage of workmen's sheds. The insides of the furnaces are lined with a sort of baked earth, adapted to sustain the action of fire, and the same earth serves also for melting-pots, cisterns, &c. The cisterns are about a yard long, and half as wide, they serve for the conveyance of liquid glass, which is drawn out of the melting-pots, to the casting tables. When the matter is sufficiently vitrified, refined, and settled, they fill the cisterns, and leave them in the furnace, till they appear white through excessive heat. The table on which the glass is to be run, is of cast iron. There is a curious machinery to remove the ci-

much in the same manner as they blow glass for windows, but on a larger scale. The other, casting or running of them, which is generally practised in making large glasses. The French claim the honour of this invention. It was first proposed to the French court in 1688, by the Sieur Abraham Thevart. It is performed in nearly a similar manner to the casting of sheet-lead, and this method not only enables them to make glasses of more than double the size of any made by blowing, but also to cast all kinds of borders mouldings, &c. The furnaces for melting the materials of this manufacture are of enormous size, and those for annealing the glasses when formed, still larger. There are at least twenty-four annealing furnaces or ovens, each above twenty feet long placed around a melting furnace. All these furnaces are covered over with a large shed, under which are likewise built forges and workhouses for smiths, carpenters, and other artificers,

who

who
and
naces
and t
So th
Gobi
fonois
manu
than
The
a fort
action
for me
are al
they
glass,
pots,
matter
settled,
in the
excessi
glass is
is a cu

who are continually employed in repairing and keeping in order the machines, furnaces, &c. as also apartments for these, and the workmen employed about the glass. So that the glass-house in the castle of St. Gobin, in the forest of Fere, in the Soissonois, celebrated for its excellence in this manufacture, appears more like a little city, than an assemblage of workmen's sheds. The insides of the furnaces are lined with a sort of baked earth, adapted to sustain the action of fire, and the same earth serves also for melting-pots, cisterns, &c. The cisterns are about a yard long, and half as wide, they serve for the conveyance of liquid glass, which is drawn out of the melting-pots, to the casting tables. When the matter is sufficiently vitrified, refined, and settled, they fill the cisterns, and leave them in the furnace, till they appear white through excessive heat. The table on which the glass is to be run, is of cast iron. There is a curious machinery to remove the ci-

sterns from the furnaces to the table, which places them in an inclined position, so as to discharge a torrent of matter, like liquid fire, with which the table is presently covered. As soon as the glass is come to a consistence, they shove it off into the annealing furnace, with an iron raker as wide as the table, being assisted by workmen on the other side of the furnace, who pull it to them with iron hooks.

CHARLES.

I cannot imagine how they contrive to remove them in that burning state, without either breaking the glasses, or hurting themselves.

MR. HARCOURT.

The surprising dexterity and quickness, with which they perform the different operations, is inconceivable to those who have not been eye-witnesses of that wonderful manufacture. The tisors, or person's employed in heating the large furnaces, run round the furnace in their shirts, with-

out

out the least intermission, with a speed scarce inferior to that of the lightest courier; as they go along, they take two billets of wood, and throw them into the first furnace, and continuing their course, do the same for the second. This they hold on uninterruptedly for six hours together. One would not expect, that two such small pieces of wood, which are consumed in an instant, would maintain the furnace in the proper degree of heat, which is so great, that a large bar of iron, laid at one of the mouths of the furnace becomes red hot in less than half a minute. The process of these glasses is now completed, except grinding, polishing, and foliating, or laying on of the quicksilver. The grinding of glass requires great nicety, when performed on glasses that are designed for telescopes, or other optical uses. Plate or cast glass is ground by placing it on a stone table, in such a manner, that it cannot be shaken or

O 3

displaced,

displaced, and then by means of a wooden frame, another glass is rubbed backwards and forwards over it, with water and sand between them, and thus by constant attrition their surfaces become smooth.

MRS. HARCOURT.

Various are the uses to which the ingenious invention of glass is applied; besides the different accommodations with which it supplies domestic wants, such as windows, looking-glasses, and all the innumerable variety of vessels that adorn our tables, and contribute to our convenience. Natural philosophy is greatly assisted by telescopes, microscopes, magnifying glasses, &c. which enable us to view objects too minute ever to be examined by the naked eye. Many experiments in electricity, and on the properties of the air, the knowledge of which is called pneumatics, could not be performed without the assistance of glass. The eye-sight of aged persons, or those who have a defective sight, receive relief
from

from
fought
They
monk
it only
suppli
ments
well
deceiv
tical j

Am
ed, yo
are foc
into o
setting
Some
the ce
invent
that t
sieging
Marce
Thus

from spectacles, which they must have sought in vain, without this invention. They were the fortunate discovery of a monk of Pisa, in the year 1299. Nor does it only serve for useful purposes: it also supplies us with various kinds of ornaments. Most of the precious stones are so well imitated by this composition, as to deceive the eye of those, who are not critical judges.

CHARLES.

Among the variety you have enumerated, you have omitted burning glasses, which are so contrived, that they draw the sun's rays into one point or focus, and are capable of setting fire to any thing that will burn. Some historians relate, that Archimedes, the celebrated mathematician of Syracuse, invented glasses of this kind, so powerful, that they set fire to the Roman ships, besieging Syracuse, under the command of Marcellus, and destroyed the whole fleet. Thus the ingenuity and invention of one
man

man was able to resist and repel the united force of thousands, under the command of the most accomplished general of his age and country.

MR. HARCOURT.

Your historical anecdote is very suitably introduced, and is an eminent instance of the superiority of wisdom over brutal strength.

SOPHIA.

Has not the invention of the armonica some claim to be mentioned, before we dismiss this subject?

MRS. HARCOURT.

I am not surprised it should be recollected by a lover of music; but Sophia, you must not raise curiosity without satisfying it, perhaps some of the company may not know what an armonica is.

SOPHIA.

The armonica is a musical instrument, peculiar for the sweetness of its tones, and consists of glasses, of the shape of a globe,
cut

cut in half. The whole set is fixed upon a spindle, and then played upon by turning them round with a wet finger.

MR. HARCOURT.

This method of producing musical sounds, though first introduced among us by Mr. Puckeridge of Ireland, has been long since practised in Germany: and the Persians have also a similar invention, by striking seven cups of porcelain, containing a certain quantity of water, with small sticks.

CECILIA.

Among the other curiosities made of glass, give me leave to mention Rupert's drops, which are formed somewhat in the shape of a pear, of green glass, and though they will bear the heaviest stroke of a hammer without breaking, fly to pieces in a moment, if you break off the tip of the tail.

HENRY.

Pray what did they make windows of, before there was any glass? I can think of
nothing

nothing that would keep out the cold, and be clear at the same time.

MRS. HARCOURT.

Horn and oiled paper were the substitutes they were obliged to use. Glass-windows were not known in England till 1180; and then were considered as a mark of great magnificence, suitable only to palaces, churches, &c. The Italians possessed this art first. The French learned it of them, and from thence it was brought into England. Venice for many years excelled all Europe in the fineness of its glasses: and in the thirteenth century, were the only people that had the secret of making crystal looking-glasses. The glass manufacture was first begun in England in 1557. Glass plates were made at Lambeth, in 1673, under the patronage of the Duke of Buckingham, who introduced this manufacture into England, with amazing success. So that in a century we have attained the art in a degree, that rivals even
the

the Ve
to be f
reign c

Wha
sometin
one in
to be v
Lloyd,
Papa w
she add
ments t

Rem
leisure
been in
lence;
her ind
serve h
cient m
simple,
ment o
in some

the Venetians, and are no longer obliged to be supplied with this article from foreign countries.

AUGUSTA.

What beautiful painted windows I have sometimes observed in churches. There is one in Norwich cathedral, that is reckoned to be very finely painted, done by Mrs. Lloyd, who was the wife of one of the deans. Papa was acquainted with her, and he says she added many other elegant accomplishments to her skill in painting on glass.

MRS. HARCOURT.

Remark how much better this lady's leisure was employed, than it would have been in idle dissipation, or slothful indolence; her works remain a testimony of her industry and taste, and will long preserve her name from oblivion. The ancient manner of painting in glass was very simple, and consisted in the mere arrangement of pieces of glass of different colours, in some sort of symmetry, and constituted

a species of what we call mosaic work. In time, the taste for this kind of work improved, and the art being found applicable to the adorning of churches and other public buildings, they found means of incorporating the colours with the glass itself, by exposing them to a proper degree of fire, after the colours are laid on.

MR. HARCOURT.

There is an easy method of painting small pictures on glass, called back-painting, which requires but little skill, and produces a pretty effect. You must take a piece of crown glass, the size of the print you intend to paint, a metzotinto is the best adapted to the purpose: soak your print in clean water for forty-eight hours, if it be on very strong, close, hard gummed paper, but if on a soft spongy paper, two hours will be sufficient; then lay the print between four sheets of paper, two beneath it, and two above it, that the moisture may be drawn out of it. In the mean while,

while, let the glass be warmed at the fire, then with a hogs-hair brush dipped in melted Strasburg turpentine, smear the glass smoothly and evenly. Lay the print upon the glass, rubbing it gently from one end to the other, that it may lie close. With the finger rub off the paper from the back-side of the print, till nothing can be seen, but the print, like a thin film upon the glass, and set it aside to dry. When it is well dried, varnish it over with some white transparent varnish, that the print may be seen through it, which is now fit for painting. Having prepared a variety of oil colours, which must be ground very fine, and tempered very stiff, lay such colours on the transparent print as your fancy and taste direct; the outlines of the print guiding the pencil, and it will produce a very pretty effect. You must be careful to lay on the colours thick enough to appear plainly through the glass. When your grotto is finished, you may exercise yourselves this

P

way,

way, and each one produce a picture, though much inferior to those works that require the hand of an artist, yet affording amusement for a leisure hour, and varying the course of your occupations. Adieu, my dear children; I wish you repose and pleasant dreams.

CONVERSATION IX.

HENRY.

May I be allowed to chuse a subject for this evening. I want to know what sugar is made of. I heard Mr. Jenkins say it was a salt, and I think he must be mistaken, for I cannot taste the least flavour of salt in it.

MR. HARCOURT.

Chemically considered, he is in the right. Sugar is a sweet, agreeable, saline juice expressed from many different kinds
of

of vegetables. Carrots, parsnips, white and red beets yield sugar, but the plant, from which the sugar, that is generally used, is procured, is the sugar-cane; a sort of reed that grows in great plenty, in both the East and West-Indies. Sophia, endeavour to give us a botanical definition of it.

SOPHIA.

It is a genus of the triandria digynia class. Its characters are, that it has no empalement; but instead of it, a woolly down longer than the flower, that incloses it. The flower is bivalve, the valves are oblong, acute pointed, concave, and chaffy. It has three hairs like stamina, the ends of the valves terminated by oblong summits; and an awl-shaped germen, supporting two rough styles, crowned by single stigmas, the germen becomes an oblong, acute pointed seed, invested by the valves. It is cultivated in both the Indies for its juice,

which when boiled, affords that sweet salt which is called sugar.

MR. HARCOURT.

The canes grow from eight to twenty feet high, they are jointed, and at each joint are placed leaves. They are propagated by cuttings, which are generally taken from the tops of the canes, just below the leaves; a deep soil, and light land are most suitable to the sugar-plant, and the rainy season is the proper time for planting it. The ground should be marked out by a line, that the canes may be regularly disposed, and at equal distances. The common method of planting them, is to make a trench with a hoe, which is performed by the hand; into this trench a negro drops the number of cuttings intended to be planted, which are planted by other negroes, who follow him: and the earth is drawn about the hills with a hoe.

CHARLES.

I fancy agriculture is not so well understood

flood in the Indies, as it is in Europe: or they would make use of the plough in these operations; as it would perform the work both more expeditiously, and in a completer manner, than can be done by the hand. What length of time, and what multitudes of hands, would it occupy, to hoe up all the land in England, that is to be sowed with corn every season.

MR. HARCOURT.

Horses are very scarce in the West-Indies especially, and almost all laborious operations are performed by the hands of negro slaves.

AUGUSTA.

Are those countries inhabited by negroes? I understood that they were the natives of Africa.

MR. HARCOURT.

You were rightly informed, my dear, they are indeed natives of Africa, but snatched from their own country, friends, and connections, by the hand of violence,

and power. I am ashamed to confess that many ships are annually sent from different parts of England, particularly Bristol and Liverpool, to the coast of Guinea, to procure slaves from that unhappy country, for the use of our West-India islands, where they are sold to the planters of sugar-plantations, in an open market like cattle, and afterwards employed in the most laborious and servile occupations, and pass the rest of their lives in an involuntary and wretched slavery.

SOPHIA.

How much my heart feels for them!
How terrible must it be, to be separated from one's near relations! Parents perhaps divided from their children for ever; husbands from their wives; brothers and sisters obliged to take an eternal farewell. Why do the kings of the African states suffer their subjects to be so cruelly treated?

MRS.

MRS. HARCOURT.

Many causes have operated to induce the African princes to become assistants in this infamous traffic, and instead of being the defenders of their harmless people, they have frequently betrayed them to their cruellest enemies. The Europeans have found the means of corrupting these ignorant rulers, with bribes of rum, and other spirituous liquors, of which they are immoderately fond. At other times they have fomented jealousies, and excited wars between them, merely for the sake of obtaining the prisoners of war for slaves. Frequently they use no ceremony, but go on shore in the night, set fire to a neighbouring village, and seize upon all the unhappy victims, who run out to escape the flames.

CECILIA.

What hardened hearts must the captains of those ships have. They must have become

come extremely cruel, before they would undertake such an employment.

MRS. HARCOURT.

It is much to be feared that most of them, by the habits of such a life, are become deaf to the voice of pity; but we must compassionate the situation of those, whose parents have early bred them to this profession, before they were of an age to chuse a different employment. But to resume the subject of the negroes. What I have related, is only the beginning of their sorrows. When they are put on board the ships, they are crouded together in the hold, where many of them mostly die from want of air and room. There have been frequent instances of their throwing themselves into the sea, when they could find an opportunity, and seeking a refuge from their misfortunes in death. As soon as they arrive in the West-Indies, they are carried to a public market, where they are sold to the best bidder, like horses at our fairs.

fairs. Their future lot depends much upon the disposition of the master, into whose hands they happen to fall, for among the overseers of sugar-plantations, there are some men of feeling and humanity; but too generally their treatment is very severe. Accustomed to an inactive indolent life, in the luxurious and plentiful country of Africa, they find great hardship from the transition, to a life of severe labour without any mixture of indulgence to soften it. Deprived of hope of amending their condition, by any course of conduct they can pursue, they frequently abandon themselves to despair, and die, in what is called the seasoning, which is becoming inured by length of time to their situation. Those who have less sensibility and stronger constitutions, survive their complicated misery but a few years: for it is generally acknowledged that they seldom attain the full period of human life.

AUGUSTA.

AUGUSTA.

Humanity shudders at your account; but I have heard a gentleman, that had lived many years abroad, say, that negroes were not much superior to the brutes, and that they were so stupid and stubborn, that nothing but stripes and severity could have any influence over them.

MR. HARCOURT.

That gentleman was most probably interested in misleading those with whom he conversed. People who argue in that manner, do not consider the disadvantages the poor negroes suffer from want of cultivation. Leading an ignorant savage life in their own country, they can have acquired no previous information: and when they fall into the hands of their cruel oppressors, a life of laborious servitude, which scarcely affords them sufficient time for sleep, deprives them of every opportunity of improving their minds. There is no reason to suppose that they differ from us in any thing

thing but colour, which distinction arises from the intense heat of their climate. There have been instances of a few, whose situation has been favourable to improvement, that have shewn no inferiority of capacity: and those masters, who neglect the religious and moral instruction of their slaves, add a heavy load of guilt to that already incurred, by their share in this unjust and inhuman traffic.

CHARLES.

My indignation arises at this recital. Why does not the British parliament exert its power, to avenge the wrongs of these oppressed Africans? what can prevent an act being passed to forbid Englishmen from buying and selling slaves?

MR. HARCOURT.

Mr. Wilberforce, a name that does honour to humanity, has made several fruitless efforts to obtain an act for the abolition of this trade. Men interested in its continuance, have hitherto frustrated his
noble

noble design; but we may rely upon the goodness of that Divine Providence, that careth for all creatures, that the day will come, that their rights will be considered, and there is great reason to hope, from the light already cast upon the subject, that the rising generation will prefer justice and mercy, to interest and policy: and will free themselves from the odium we at present suffer, of treating our fellow-creatures in a manner unworthy of them, and of ourselves.

MRS. HARCOURT.

Henry, repeat that beautiful apostrophe to a negro woman, which you learned the other day out of Mrs. Barbauld's Hymns.

HENRY.

" Negro woman, who sittest pining in
 " captivity, and weepest over thy sick child,
 " though no one seeth thee, God seeth thee;
 " though no one pitieth thee, God pitieth
 " thee. Raise thy voice, forlorn, and abandon
 " done

"doned one; call upon him from amidst thy
"bonds, for assuredly he will hear thee."

CECILIA.

I think no riches could tempt me to have any share in the slave-trade. I could never enjoy peace of mind, whilst I thought I contributed to the woes of my fellow-creatures.

MR. HARCOURT.

But Cecilia, to put your compassion to the proof. Are you willing to debar yourself of the many indulgencies that we enjoy, that are the fruit of their labour? sugar, coffee, rice, calico, rum, and many other things, are procured by the sweat of their brow.

CECILIA.

I would forego any indulgence to alleviate their sufferings.

The rest of the Children together.

We are all of the same mind.

MRS. HARCOURT.

I admire the sensibility of your uncor-
rupted

rupted hearts, my dear children. It is the voice of nature and virtue. Listen to it on all occasions, and bring it home to your bosoms, and your daily practice. The same principle of benevolence which excites your just indignation at the oppression of the negroes, will lead you to be gentle towards your inferiors, kind and obliging to your equals, and in a particular manner condescending and considerate towards your domestics; requiring no more of them, than you would be willing to perform in their situation; instructing them when you have opportunity; sympathizing in their afflictions, and promoting their best interests when in your power.

AUGUSTA.

My governess forbids me ever to speak to the servants, therefore I cannot shew them any kindness, without disobeying her.

MRS. HARCOURT.

Your governess shews her discretion in forbidding you to be familiar with the servants. Their want of education renders them

them improper companions, but can never deprive them of their claim to our tenderness and good offices.

MR. HARCOURT.

It is time to proceed in our account of the process of preparing the juice of the sugar-cane for use. When the canes are ripe, they are cut, and carried in bundles to the mill. The mills consist of three wooden rollers, covered with steel-plates, and are set in motion, either by water, wind, cattle, or even the hands of slaves. The juice being squeezed out of the canes, by the rollers, runs through a little canal into the sugar-house, where it falls into a vessel, from whence it is conveyed into the first copper. With the liquor is mixed a quantity of ashes and quick-lime, which serves to purify it, by raising up the unctuous matter in form of a scum to the top, which is skimmed off and given to poultry. This operation is performed five or six times, till the sugar is sufficiently purified, and become of a proper thickness to be

converted into the various kinds for use. It is then put into hogsheds, and sent over to England to the care of the sugar-refiners, whose business it is to complete the process, by boiling it up with bullocks blood, in order to clear it. Sometimes whites of eggs are used for the same purpose. They add a little of the finest indigo to give it a good colour. It is boiled over again that the moist parts may evaporate. The next thing to be done is to fill the moulds, which are in the form of inverted cones. The rooms in which these moulds are placed, are heated to a suitable degree, to dry the sugar they contain. When the loaves are fully dried, they are papered, and sold to the grocer.

HENRY.

Are sugar-candy and barley-sugar made from the sugar-cane? they are different from sugar both in taste and colour.

MR. HARCOURT.

The material is the same, although the preparation varies. Sugar-candy, is sugar crystal.

crystal
lime-w
ed thro
terward
are cro
as it c
pended
and the
this, th
cross th
splinter
quite d
sugar i
candy i
of the
sugar i
boiled t
a stone
and for
be boil
whence
cast s
amber c

crystallized. It is first dissolved in a weak lime-water, then clarified, scummed, strained through a cloth, and boiled. It is afterwards put into forms or moulds, that are crossed with threads to retain the sugar as it crystallizes. These forms are suspended in a hot stove, which is shut up, and the fire made very vehement. Upon this, the sugar fastens to the strings that cross the forms, and there hangs in little splinters of crystal. When the sugar is quite dry, the forms are broken, and the sugar is taken out candied. Red sugar-candy is coloured, by pouring a little juice of the Indian fig into the vessel, whilst the sugar is boiling. Barley-sugar, is sugar boiled till it is brittle, and then poured on a stone anointed with oil of sweet almonds, and formed into twisted sticks. It should be boiled up with a decoction of barley, whence it takes its name, they sometimes cast saffron into it, to give to it the bright amber colour.

MRS. HARCOURT.

Sugar is a very useful commodity. It preserves both animal and vegetable substances from putrefaction; and we are indebted to it, on this account, for all the variety of conserves and sweetmeats which adorn and enrich our repasts. White sugar-candy is used by miniature painters to prevent the colours from cracking, when mixed with gum arabic; and Henry need not be told how useful barley-sugar is in coughs and hoarsenesses.

MR. HARCOURT.

It is supposed, that although the ancients were acquainted with this plant, they were ignorant of our method of refining and preparing it. The first account we have of sugar refiners in England, is in the year 1659. Several other things are produced from the sugar-cane. Treacle is the syrup that runs from the barrels of raw sugar. Rum is distilled from the sugar-cane.

CHARLES.

CHARLES.

Is not arrack also made from sugar?

MR. HARCOURT.

It is sometimes distilled from rice and sugar, fermented with the juice of coconuts; but it is generally distilled from a vegetable juice called toddy, which flows by incision out of the cocoa-nut tree, like the birch juice procured among us for wine. The sugar-house of a refiner is a large building, consisting of six or seven floors, and the utensils necessary to perform the different operations, require the aid of various kinds of workmen. The pans, coolers, cisterns, syrup-pipes, basons, ladles, skimmers, and sometimes the candy-pots are made of copper. Pipes, pumps, and cisterns made of lead are also used. The iron-founder supplies bars of a triangular form to be laid under the pans; also the cockel, which is an iron trunk used to dry the goods in the stove, iron-doors, &c. The carpenter is required to furnish racks,

2

troughs,

troughs, stools, blocks, coolers, oars, &c. Tubs and backs to hold the lime-water, which contain from thirty to two hundred barrels, employ the back-maker. The wicker-work consists of refining-baskets, scum-baskets, pulling up-baskets, coal and clay-baskets, &c. Thus if we consider the numbers employed in building the ships used in bringing over the sugar, and in conveying the poor slaves from their own country; planters, overseers, &c. we may suppose that we do not taste a lump of sugar that is not produced by the united labour of a thousand hands.

SOPHIA.

And yet we use the conveniencies of life in a careless wasteful manner, without reflecting one moment on the trouble necessary to procure them. May I relate the manner of obtaining the maple-sugar, which some have endeavoured to introduce in the room of the produce of the sugar-cane.

MRS.

MRS. HARCOURT.

By all means, it will give us pleasure to hear it.

SOPHIA.

The *acer saccharinum*, or the sugar-maple-tree, grows in great quantities in the western countries of all the middle states of the American Union. These trees are generally found mixed with the beech, hemlock, white and water-ash, the cucumber-tree, linden, aspen, butter-nut, and wild cherry-trees. They grow only on the richest soils, and frequently in stony ground. Springs of the purest water abound in their neighbourhood. They are, when fully grown, as tall as the white and black oaks, and from two to three feet in diameter. They put forth a beautiful white blossom in the spring before they shew a single leaf. The wood of the maple-tree is extremely inflammable. Its small branches are so much impregnated with sugar, as to afford support

to the cattle, horses, and sheep of the first settlers, during the winter, before they are able to cultivate forage for that purpose. Its ashes afford a great quantity of pot-ash, exceeded by few of the trees that grow in the woods of the United States. The tree is supposed to arrive at its full growth in twenty years. It is not injured by tapping, on the contrary, the oftener it is tapped, the more syrup it yields. The effects of a yearly discharge of sap from the tree, in improving and increasing the sap, are demonstrated from the superior excellence of those trees, which have been perforated in an hundred places, by a small wood-pecker, which feeds upon the sap. The method of obtaining the sap, is by boring a hole in the tree, with an auger; a spout is introduced about half an inch into the hole, made by the auger. The sap flows from four to six weeks, according to the temperature of the weather. Troughs

are

are placed
sap, which
receives
strained
modes
evaporat
of which
The pro
its sugar
lasses, and
which is
tained, and
has cease
tories of
maple-tr
sere with
be used
summer
moreover
A tree so
tivated,
sugar; and

are placed under the spout to receive the sap, which is carried every day to a large receiver, whence it is conveyed, after being strained to the boiler. There are three modes of reducing the sap to sugar; by evaporation, by freezing, and by boiling, of which the latter is most expeditious. The profit of this tree is not confined to its sugar. It affords a most agreeable molasses, and an excellent vinegar. The sap, which is suitable for these purposes, is obtained, after the sap which affords the sugar has ceased to flow, so that the manufactories of these different products of the maple-tree, by succeeding, do not interfere with each other. The molasses may be used to compose the basis of a pleasant summer beer. The sap of the maple is moreover capable of affording a spirit. A tree so various in its uses, if duly cultivated, may one day supply us with sugar; and silence the arguments of the
planters,

planters, for a continuance of the slave-trade.

MR. HARCOURT.

Very philosophically observed. We thank you, for your entertaining account, and wish you good-night, as it is already past the usual time of separation.

CONVERSATION X.

CECILIA.

I THANK you, dear mamma, in the name of my brothers and sister, for the pleasure you have given us, in allowing us to accept Farmer Dobson's invitation to his sheep-shearing. We have passed a very agreeable afternoon, both from the civility of the honest farmer and his wife, and the novelty of the scene, which was very striking to us, as we had never seen any thing of the kind before. It remind-
ed

ed me of Thomson's description of a sheep-shearing, which with your leave I will repeat.

MRS. HARCOURT.

It will give me pleasure to hear it, provided you are careful to speak slow, distinct, and give every word its proper emphasis.

CECILIA.

In one diffusive band,
They drive the troubled flocks, by many a dog
Compell'd, to where the mazy-running brook
Forms a deep pool; this bank abrupt and high,
And that fair-spreading in a pebbled shore,
Urg'd to the giddy brink, much is the toil,
The clamour much, of men, and boys, and dogs,
Ere the soft fearful people to the flood
Commit their woolly sides. And oft the swain,
On some impatient seizing, hurls them in:
Embolden'd then, nor hesitating more,
Fast, fast, they plunge amid the flashing wave,
And, panting, labour to the farthest shore.
Repeated this, till deep the well wash'd fleece
Has drunk the flood, and from his lively haunt

R

The

The trout is banish'd by the sordid stream;
Heavy, and dripping, to the breezy brow
Slow move the harmless race : where, as they spread
Their swelling treasures to the sunny ray,
Inly disturb'd, and wondering what this wild
Outrageous tumult means, their loud complaints
The country fill; and, tofs'd from rock to rock,
Incessant bleatings run around the hills.
At last, of snowy white, the gathered flocks
Are in the wattled pen innumeros press'd,
Head above head; and rang'd in lusty rows,
The shepherds sit, and whet the sounding shears.
The housewife waits to roll her fleecy stores,
With all her gay-dress'd maids attending round.
One, chief, in gracious dignity enthron'd,
Shines o'er the rest, the pastoral queen, and rays
Her smiles, sweet beaming, on her shepherd king;
While the glad-circle round them yield their souls
To festive mirth, and wit that knows no gall.
Meantime, their joyous task goes on apace :
Some mingling stir the melted tar; and some,
Deep on the new shorn vagrant's heaving side
To stamp his master's cypher ready stand;
Others th' unwilling wedder drag along;
And, glorying in his might, the sturdy boy
Holds by the twisted horns th' indignant ram.
Behold, where bound, and of its robe bereft,

By

By ne
How r
What
What
Fear n
Of ho
No, 't
Who l
Borrow
Will f

Tol
quaint
united
ful en
deligh
lected
gant a
domes
so fre
which
from t
able p

By needy man, that all-depending lord,
How meek, how patient, the mild creature lies !
What softness in its melancholy face,
What dumb complaining innocence appears !
Fear not, ye gentle tribes, 'tis not the knife
Of horrid slaughter that is o'er you wav'd ;
No, 'tis the tender swain's well-guided shears,
Who having now, to pay his annual care,
Borrow'd your fleece, to you a cumbrous load,
Will send you bounding to your hills again.

MRS. HARCOURT.

Tolerably well repeated; a general acquaintance with the best English poets, united with a retentive memory and graceful enunciation, will furnish the rare and delightful accomplishment of repeating selected passages, which may supply an elegant amusement for the vacant hour of domestic leisure, and prevent that lassitude so frequently complained of at home, and which compels so many to seek a refuge from themselves in dissipation and fashionable pleasure.

SOPHIA.

My time is so variously filled up, that I never experience that wearisomeness.

MRS. HARCOURT.

A well chosen succession of employments, is the best antidote against ennui, as it is termed by the French, or listlessness. Reading, drawing, natural history in its different branches, simple mathematics, experimental philosophy, with various other rational pursuits, are admirably calculated to fill up the leisure hours of persons in easy circumstances, whose duties or business afford them opportunity for such studies.

MR. HARCOURT.

It is a just observation that none but the idle want employment. The active mind collects amusement from the most trifling events. Cannot a sheep-shearing supply us with a hint for the subject of our present conversation? Sophia, endeavour

to

to en
the sh

She
order
the ch
that th
wreath
have c
but no
The v
of long
riously
cloath
far as i
been c
neither
sheep,
have sh

In a
the she
and the

to entertain us with the natural history of the sheep.

SOPHIA.

Sheep, according to Linnæus are of the order of pecora, and make a distinct genus, the characters which distinguish them, are that their horns are hollow, bent backward, wreathed, and crooked, and scabrous. They have eight cutting teeth in the lower jaw, but none in the upper, and no canine teeth. The wool of these animals consists only of long slender hairs, much twisted, and variously interwoven with one another. This cloathing is peculiar to the sheep kind, so far as is yet known, no other animal having been discovered with a similar covering; neither is it possessed by all the species of sheep, some of those of the distant nations have short hair like that of the goat.

MR. HARCOURT.

In addition to your general account of the sheep, I will enumerate the species, and their peculiarities, which according to

the same great master of natural arrangement, Linnæus, are three; first the ovis aries, or ram sheep, which comprehends many varieties, such as the common sheep, with large horns twisting spirally and outwardly: the hornless sheep, with the tail hanging down to the knees; this kind is common in many parts of England. The Spanish, or many horned sheep, having usually three horns, and sometimes four or five. This sort of sheep is frequent in Iceland, Siberia, and other northern countries. The African sheep, which has short hair like that of the goat. And the broad-tailed sheep, which is common in Syria, Barbary, and Ethiopia. The tails of these are so long, as to trail upon the ground, and the shepherds are obliged to put boards with small wheels under them, to keep them from galling. These tails are esteemed a great delicacy, being of a substance between fat and marrow; they sometimes weigh fifty pounds each. The broad-tailed sheep are also found

in

in the
are e
ness,
rians
in all
wool,
gant
try fr
factur
sourc
the o
Ang
tall,
are fr
The
the h
and i
speci
sheep
a scr
outfi
gary,
on M

in the kingdom of Thibet, and their fleeces are equal to those of Caramania in fineness, beauty, and length. The Cackemirians engross this article, and have factors, in all parts of Thibet, for buying up the wool, which they work up into those elegant shawls, that are brought into this country from the East-Indies, and this manufacture supplies them with a considerable source of wealth. The second species is the *ovis Guiniensis*, commonly called the Angola sheep. They are long legged and tall, and their ears hang down, the horns are small, and bending down to the eyes. The neck is adorned with a long mane, the hair of the rest of the body is short, and it has wattles on the neck. The third species is the *ovis strepsiceros*, or Cretan sheep, with horns quite erect, twisted like a screw, and beautifully furrowed on the outside. This kind is common in Hungary, and large flocks of them are found on Mount Ida, in Crete. The manners
of

of this animal are naturally harmless and timid; it threatens by stamping with its foot, but its only resistance is by butting with its horns. It generally brings one young one at a time, sometimes two, and rarely three. It is a valuable animal to the farmer, as it is kept at the least expence of any, and will thrive upon almost any pasture ground, not particularly wet; a constant damp causes them to rot.

MRS. HARCOURT.

Almost every part of it may be applied to some useful purpose. The flesh is a delicate and wholesome food. The skin, when dressed, forms different parts of our apparel, as shoes and gloves; it is also used for covers of books. The entrails, properly prepared and twisted, are used in clocks, and various musical instruments. The bones calcined, form materials for tests for the refiner. The milk is thicker than that of cows, and consequently yields a greater quantity, in proportion, of butter and cheese;

cheese
rich in
all is
walhe
wove,
cloths
niture
cient
to the
reque

Th
cale
pear
son,
in th
the
four
his e
vesse
ject
men
whic

cheese: and even the dung is useful as a rich manure; but the most valuable part of all is the fleece, or wool, which when washed, shorn, dressed, combed, spun, and wove, makes a vast variety of stuffs and cloths, suitable both for cloathing and furniture, and was so highly valued by the ancients for its utility, as to have given rise to the story of the golden fleece, which I request the favour of Charles to relate.

CHARLES.

The ancients, always fond of fables, concealed the simplest events, under the appearance of some extraordinary story. Jason, son of Æson, king of Thessaly, sailed in the first large ship (called Argo) to fetch the golden fleece from Colchis. Fifty-four brave Thessalians accompanied him in his expedition, and from the name of the vessel are called Argonauts. Their object is supposed to have been the establishment of a profitable trade in wool, in which that country excelled. The difficulties

culties he met with in his undertaking, and which he overcame by his prudence, are represented by the fable of a dragon, that guarded the fleece, and which he is said to have killed by the assistance of Medea, an enchantress. The education this prince had received from Chiron, the centaur, famous for his arts and learning, had fitted him for cultivating commerce, and promoting useful discoveries. Jason at length reigned, and died peaceably at Colchis.

SOPHIA.

Another proof of the high veneration that was paid to the inventors of the woollen manufacture, is, that the art of preparing it was attributed to Minerva, the goddess of wisdom, and the protectress of the useful arts.

CECILIA.

We have been entertained with the history of the sheep, and a general account of its uses; but I am very desirous of knowing

ing the
dering
poses

Van
before
poses
taken
packed
when
in the
grease
dried
of wo
filth.
with
spinn
is, pa
instru
called
it for
comm
or w

ing the manner of working wool, and rendering so rough a material fit for the purposes of spinning and weaving fine cloth.

MRS. HARCOURT.

Various are the operations it undergoes, before it is in a proper state for the purposes you mention. The fleeces, when taken out of the bales in which they are packed after shearing, must be scoured; when the wool has continued long enough in the liquor to dissolve and loosen the grease, it is taken out, and well washed and dried; it is then beat with rods, on hurdles of wood, to clear it of the dust and grosser filth. The next thing is to pick it, and oil it with oil of olives. It is now given out to the spinners, who first card it on the knee; that is, pass it between the points or teeth of two instruments, something like a curry-comb, called cards, to disentangle it, and prepare it for spinning, which is an operation too common to need description. The thread, or worsted being spun, reeled, and made
into

into skeins, is ready for the hand of the weaver, who begins his work by putting the warp, or threads, the long way of the piece, into the loom, which he stiffens with size before he forms the woof, which is done by throwing the thread with a shuttle across the warp, till the work be finished; when it is to be cleared of all knots, &c. and carried to the fuller to be scoured and cleansed, ready for dying; after it is dyed, it is pressed and prepared for sale. Different kinds of goods require variation in the process, according to the kind of stuff intended to be made.

AUGUSTA.

Wool is applied to a vast many different purposes, what are the principal manufactures in which it is employed?

MR. HARCOURT.

Let Henry endeavour to enumerate the things that we use, that are made of wool.

HENRY

HENRY.

Broad cloths for men's coats, flannel, blankets, carpets, rugs, caps, stockings, and various kinds of stuffs.

CECILIA.

All stockings are not knitted, how are the others made?

MR. HARCOURT.

They are wove in a machine, called a stocking-frame, very ingeniously contrived, but too complex to give you any idea of it by description. Wool is the staple commodity of this island, and forms the principal article in our foreign and domestic trade. The yearly produce of wool in England, towards the close of the last century, was calculated at two millions sterling, and consequently it gives employment to a vast number of hands. A pack, or two hundred and forty pounds weight of short wool, is computed to employ sixty-three persons a week, to manufacture it into cloths: and when it is made into stuffs or

S

stockings,

stockings, it employs a much greater number.

CHARLES.

The working of wool is doubtless an invention of great antiquity; but how long has it been introduced into England?

MR. HARCOURT.

It may be said to have risen into notice about the fourteenth century. King Edward the third introduced the fine woollen manufacture from the Netherlands. Queen Elizabeth greatly improved the state of this manufacture by her patronage, in which she received considerable assistance from the troubles in the low countries, excited by the severity of the Duke of Alva, and the Spanish inquisition, on account of religion, which drove numbers of manufacturers to take shelter in England, where they enjoyed protection and encouragement to settle. Contrast the conduct of Elizabeth and the Duke of Alva. The one cherished the useful arts, and diffused happiness

happiness and wealth among her people; the other, from a gloomy superstition, deprived his country of useful manufacturers, and obliged them to take refuge in the dominions of his rival, which they enriched by their labours and skill.

MRS. HARCOURT.

Nature is an excellent instructress. From the nautilus men learned the art of sailing. From the spider they are supposed to have been taught the art of weaving. Attention to natural objects will probably supply new discoveries, which are now unthought of.

CHARLES.

What country produces the finest wool?

MR. HARCOURT.

The wool of Asia excels that of Europe. Of the European, none is more valued than the Spanish and the English. Spain is famous for its breed of sheep, they have frequently ten thousand in a flock, under

S 2

the

the care of fifty shepherds, who are subservient to the authority of one man.

HENRY.

I think I should like to be a shepherd, it must be an easy pleasant life.

MRS. HARCOURT.

They generally pass their time in a very indolent useless manner; though some in the north of England knit stockings, yet it appears to me, that a better plan of employment might be suggested for them, without interfering with their principal occupation. Those who could read and write, might keep a register of the weather, and make observations upon the natural objects that presented themselves to their view, which might be a means of promoting useful knowledge.

CHARLES.

Is it not the custom for the lord chancellor, the judges, and masters in chancery, to be seated on woolpacks, in the house of Lords?

MR.

MR. HARCOURT.

That is a custom not very easy to be account for, unless it is to remind them of protecting and maintaining the woollen manufactures of this country.

MRS. HARCOURT.

It is time to put an end to our conversation. Supper is ready. Good night, Children.

END OF THE FIRST VOLUME.



Just Published,

Price One Shilling and Six-pence, half-bound, with Vellum Back.

LEISURE HOURS,

OR

ENTERTAINING DIALOGUES,

Between persons Eminent for Virtue and Magnanimity.

The Characters drawn from Ancient and Modern History, designed as Lessons of Morality for Youth.

In the Press, and soon will be published,

THE SECOND VOLUME OF
MENTAL IMPROVEMENT.

